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GEOLOGICAL SOCIETY,
March 25th, 1846.

LIBRARY-REGULATIONS.

THE Council, with a view to the convenience of the Fellows generally, and to the better care of Works that are easily injured, have deemed it expedient to make the following regulations, in conformity with Section XIX. Art. 1. of the Bye-laws.

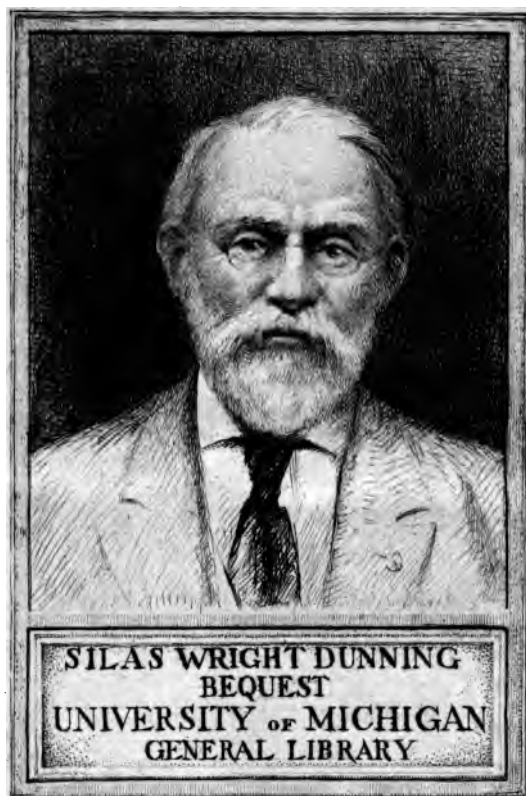
1. The Books shall only be delivered to a Fellow of the Society, or to some one producing a written order from such Fellow; and a receipt shall be given by the person to whom the book is delivered (expressing the name of the Fellow for whom it is received), in a book kept for that purpose.
2. Any Fellow failing to return a book on the application of the Council, or returning books torn or defaced, shall be considered as liable for their value; and if they are separate volumes, for the value of the whole work rendered imperfect.
3. All books allowed to circulate may be retained a fortnight; after the expiration of that time, every book shall be immediately returned so soon as the Fellow shall receive an intimation from the Librarian that it is wanted; and every book shall be returned after the expiration of one month from the date of its having been delivered from the Library.
4. All books shall be returned on the 1st of November for a fortnight, at which period the Librarian shall deliver a report to the Council on the state of the Library.
5. No Fellow shall have in his possession at one time more than Six Volumes, without the permission of the Council.
6. Any Member failing to comply with the above regulations after receiving notice from the Librarian shall be fined half-a-crown for every week that a volume is detained beyond the time allowed; and the privilege of having books from the Library shall cease until the fines are paid and the books are returned.
7. All charges of carriage and delivery of books, &c. to and from Fellows, shall be defrayed by the Fellow borrowing the same.

EXCEPTIONS.

- I. There are certain books which cannot be allowed to circulate. A list of these shall be prefixed to the printed Catalogue of the Library, and a notice of such additions to that list as the Council may from time to time feel it necessary to make shall be fixed up in the Library.
- II. No Map, Section, or Drawing can be allowed to circulate without permission in writing granted by the Council, or by the President or one of the Secretaries.
- III. No book or illustration in loose sheets shall be allowed to circulate.
- IV. No Periodical Publication, and no Volume or part of the Transactions of any Society shall be allowed to circulate until after the expiration of four months from the date of its having been received at the Society.
- V. All new works shall circulate amongst the Fellows after the expiration of a fortnight from the time of their being received, unless the Council (or, during the recess, the President or one of the Secretaries) shall determine otherwise.

No Book lent to the Society is allowed to circulate without a written order from the Proprietor.





1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for transparency and accountability, particularly in the context of public administration and financial management. The text outlines various methods and tools that can be used to ensure the integrity and reliability of the data collected.

2. The second part of the document focuses on the challenges associated with data collection and analysis. It highlights the need for standardized procedures and protocols to ensure that data is consistent and comparable across different sources and time periods. The text also discusses the importance of data security and privacy, particularly when dealing with sensitive information.

3. The third part of the document addresses the issue of data interpretation and reporting. It emphasizes that data should be presented in a clear and concise manner, using appropriate visual aids and statistical methods to facilitate understanding. The text also discusses the importance of providing context and background information to support the data presented.

4. The fourth part of the document discusses the role of technology in data management and analysis. It highlights the benefits of using modern software and hardware solutions to streamline data collection, storage, and analysis. The text also discusses the importance of ensuring that technology is used responsibly and ethically, particularly when dealing with personal data.

5. The fifth part of the document discusses the importance of ongoing monitoring and evaluation. It emphasizes that data should be used to inform decision-making and to identify areas for improvement. The text also discusses the importance of regular communication and reporting to stakeholders to ensure transparency and accountability.

6. The sixth part of the document discusses the importance of training and capacity building. It emphasizes that staff should be trained in data management and analysis techniques to ensure that they are able to effectively use the data collected. The text also discusses the importance of providing ongoing support and resources to staff to ensure that they are able to keep up-to-date with the latest developments in the field.

7. The seventh part of the document discusses the importance of collaboration and partnership. It emphasizes that data management and analysis should be a collaborative effort involving all relevant stakeholders. The text also discusses the importance of sharing data and information with other organizations to promote transparency and accountability.

8. The eighth part of the document discusses the importance of ethical considerations. It emphasizes that data should be collected and used in a way that respects the privacy and rights of individuals. The text also discusses the importance of obtaining informed consent from individuals before collecting their data.

9. The ninth part of the document discusses the importance of data quality. It emphasizes that data should be accurate, complete, and reliable. The text also discusses the importance of identifying and addressing any issues with data quality as soon as possible.

10. The tenth part of the document discusses the importance of data security. It emphasizes that data should be protected from unauthorized access and use. The text also discusses the importance of implementing robust security measures to ensure that data is safe and secure.

6.

No. XXI.]

[Vol. VI.]

THE JOURNAL
OF THE
BOMBAY BRANCH
OF THE
ROYAL ASIATIC SOCIETY.

JANUARY, 1867.

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JOURNAL
OF THE
BOMBAY BRANCH
OF THE
ROYAL ASIATIC SOCIETY.

JANUARY 1861.

ART. I.—*Copies of Inscriptions from the Buddhist Cave-Temples of Kánheri, &c. in the Island of Salsette, with a Plan of the Kánheri Caves.* By E. W. WEST, Esq.

Presented 12th April 1860.

THE accompanying copies of inscriptions include all that have been discovered at Kánheri, so far as they are legible,—with a few from other places. One or two inscriptions have been found to be too illegible to be copied; and a few tablets exist, intended apparently for inscriptions, but upon which no letters have been cut into the rock; these tablets possibly bore inscriptions in plaster or paint, which have long since disappeared.

The necessity for obtaining fac-similes of inscriptions by impression, in preference to copies merely sketched, has been so strongly urged by decipherers, that it appears necessary to state the reasons for adopting the latter plan. Most of the inscriptions are cut into a rough and decaying rock-surface, covered with natural markings, which, even in the original, are difficult to distinguish from the letters, and which would render an impressed fac-simile (or cast) practically illegible. In many cases the letters are so faint as to require much attention, a peculiar light, and the assistance of the sense of touch, to decipher them. Impressions of these would be useless. Fac-similes of most of the deeply-cut and easily-read inscriptions already exist; and the numerous errors found

in the printed copies of these fac-similes (especially in the vowel-marks) do not tend to show the superiority of impressions over copies. Under these circumstances, it was considered that a tolerably practised hand and eye, with some knowledge of the forms of the letters, had a better chance of producing correct copies than any other means that could be devised.

The following is an abstract of the accompanying inscriptions :—

From Kánheri, inscribed on the solid rock .. 50 inscriptions.

Do. do. on detached rocks.. 2 do.

Do. do. on stones 6 do.

Do. painted inscriptions 2 do.

From Máhakal (near Kundati), on the rock.. 1 do.

From Magathán, on a stone 1 do.

From Jogeshwari, on the rock 1 do.

From Kondana, on the rock 1 do.

Of the 52 rock-inscriptions at Kánheri, copies of 19 are given by Dr. Stevenson, with his paper dated 14th October 1852. Dr. Bird also gives copies of 27 of them, in his "Caves of Western India," as shown in the following table :—

Dr. Bird's Nos.	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
Dr. Stevenson's Nos.	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
Corresponding Nos. of accompanying copies.	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

The inscriptions appear to be of very different ages, varying probably from about the Christian era to the 13th century. They may be roughly classified, according to the forms of their letters, as follows :—

41 of the first and oldest class (the most numerous), Nos. 2 to 5, 10, 12, 13, 16 to 29, 31 to 36, 38 to 42, 44, 45, 47, 50, 52, 53, 57, 60, and 64.

2 of the second class, Nos. 11 and 37.

3 of the third class, Nos. 48, 49, and 58.

1 of the fourth class, No. 46.

5 of the fifth class, Nos. 1, 6, 7, 8, and 9.

1 of the sixth class, No. 14.

11 of the seventh and most modern class, Nos. 15, 30, 43, 51, 54, 55, 56, 59, 61, 62, 63.

Nos. 2, 3, 10, and 64 are probably the most ancient of these inscriptions.

In the following notes on the inscriptions, the numbers of the caves refer to the accompanying Plan of the whole group, which has been reduced for publication. The terms "right" and "left" have reference to the sides of a person standing *facing* the object referred to.

No. 1.—An inscription of six short and one long line, situated partly on the left-hand side, and partly beneath a standing figure of Buddha, in one corner of the recess behind the large dagob, in the open cave No. 2. The lengths of the lines are 6 inches and 12 inches. Dr. Bird gives a very incorrect copy of this inscription; it is tolerably distinct where not defaced, but has been injured by the metal scraper employed by some former copyist for cleaning out the letters.

No. 2.—An inscription of two lines, 2 feet 2 inches long, cut into the back wall of the open cave No. 2 (called "the refectory" by Dr. Stevenson), and above a long bench against the wall. This inscription is deeply cut and distinct. The name of the donor mentioned is more probably Nánunaka than Kanaka.

No. 3.—Another inscription of two lines, 2 feet 9 inches long, similarly situated, but a few feet to the north of the last, and nearer to the tank, which is in front of the cave. This inscription is also deeply cut and distinct.

No. 4.—An inscription of 22½ lines, cut into the right-hand gate-post of the chaitya, or cave No. 3. The right-hand side is imperfect, owing to that part of the gate-post having been built of squared stones, which have been since removed. The original length of the lines was 3 feet 8 inches, now reduced to 2 feet in the upper part and 3 feet 1 inch in the middle, by the removal of the stones. This inscription is deeply cut and distinct, but rather defaced in some of the lower lines. The name "Nagakanda" does not exist in the 18th line, as Dr. Stevenson supposes.

No. 5.—An inscription of eleven lines, originally 3 feet 4 inches long, cut into the left-hand gate-post of the chaitya. The left-hand side of this inscription is imperfect in the upper lines, owing to the outer angle of the gate-post (which in this case has been cut out of the solid rock) being broken off. This inscription is deeply-cut, and, the rock being smoother and of a lighter colour, it is more distinct than the last. Dr. Stevenson's copy of this inscription is exceedingly incorrect; the third line is altogether omitted in the lithograph, though given in the transcript. The letters "rája" occur near the middle of the eighth line.

No. 6.—An inscription of three lines, 2 feet 11 inches long, under a standing figure of Buddha, sculptured on the inside of the outer wall of the verandah to the chaitya, between the left-hand gate-post and the

left-hand colossal figure of Buddha. This inscription is deeply cut and tolerably distinct, though the rock is rather rough. The space between "ká" and "ri," in the first line, seems to contain an "anuswar;" the large spaces in the second and third lines are blanks.

No. 7.—An inscription of one line, 3 feet 1 inch long, under a small sitting figure of Buddha, sculptured on the back wall of the verandah of the chaitya, above the dancing figures on the right-hand side of the doorway. It is tolerably distinct, but high up, beginning with an ornamental spiral, and ending with a similar one reversed.

No. 8.—An inscription of one line, 10 inches long, cut into the square shaft of a small bas-relief dagob, on the right-hand side-wall, outside the verandah of the chaitya. This inscription is distinctly cut, but the rock is somewhat honeycombed.

No. 9.—An inscription of nine lines, 4 inches long, cut into a pilaster on the right-hand side of a standing figure of Buddha, sculptured on the western wall inside the small chamber, to the left of the entrance to the chaitya. This inscription is faintly cut.

No. 10.—An inscription of three lines and two letters, cut into one side of the square stepped-out top of the dagob, in the small circular chamber No. 4, just north of the chaitya. The lengths of the lines are 2 feet 2 inches, 1 foot 11 inches, and 1 foot 9 inches. Dr. Stevenson's transcript is not very correct.

No. 11.—An inscription of two very long lines, on the back of the recess, over the tank with two openings (No. 5), on the path up the hill. The original length of line was probably 9 feet 10 inches, of which the left-hand, 1 foot 10 inches, is entirely peeled off. This inscription is deeply cut, but much of it is defaced. The first four syllables of "māhakshatrapasya" are plain enough, but the last two are doubtful, and would require some of Dr. Bird's hasty generalisation to make them out. An amusing instance of Dr. Bird's antiquarian zeal overcoming his discretion occurs in "The Caves of Western India," page 10, where we observe the following:—"On one of the legs of the left-hand statue we meet with a cross and inscription, in Roman letters, which might be taken to be not more ancient than the times of the Portuguese, were it not for the Ethiopic or Arabic term *Abuk*, meaning *thy father*, being found here; and which, accompanied by the date 78, with a resemblance of the cross and the letters for *Kal Buddha, Buddha Sakya*, may indicate its connection with primitive Christianity; whose spurious doctrines, introduced into India, are supposed, by Wilford, to have given rise to the era of Shalivahana, which dates 78

years after Christ." Again in page 71, these letters are once more brought forward as one proof (!) of the antiquity of the caves.

The mysterious letters in question are given correctly in the left-hand margin; and the letters in the right-hand margin are taken from the western side of the third pillar from the eastern end of the verandah of

A B V J P R R

K B

I R B

I S

78

I SHAW

JOHN BUTPER

ANN BUTPER

K BAKES

1678

cave No. 10 (the Durbar Cave). Comparing these together, we come to the conclusion that these mysterious letters are the initials of *Ann Butfer*, *K. (Katharine?) Bakes*, *John Butfer*, and *John Shaw*, who visited the caves in the year 1678, and left behind them their names, which are now the oldest European names remaining inscribed.

Nos. 12 and 13.—Two inscriptions, one of three and the other of four lines, cut into the rock side by side and about six inches apart, above the two openings of the tank at the left-hand end of cave No. 7. Length of lines in the first is 2 feet 4 inches; in the second, 2 feet 9 inches. These inscriptions are deeply cut and distinct. From the "swastika" at the beginning of the first and at the end of the last, as well as from their general similarity, it would appear that they are to be read continuously, though they may commemorate two distinct gifts. The first letter of No. 13 is certainly "che."

No. 14.—An inscription of 16 lines, 6 feet 4 inches long, with part of another, and two half-lines; on the left-hand side-wall, outside the verandah of cave No. 10 (commonly called the Durbar Cave), and above a recess over the tank. This inscription is minute, but tolerably distinct where not defaced; but, owing to the complicated character, it is not easy to copy. The following spaces, where the rock is too hard to cut, are blanks: namely, one space in the first part of the sixth line, two spaces in the seventh line, one space in the middle of the tenth line, spaces at the end of the twelfth and thirteenth lines, one space in the first half of the fourteenth line, one space near the end of the fifteenth line, and one space near the middle of the sixteenth line. The thirteenth and succeeding lines are cut somewhat deeper than those above them.

No. 15.—An inscription on the architrave over the verandah colonnade of cave No. 1Q, consisting of three upper lines 11 feet long, three lower lines 11 feet 7 inches long, and two additional lines 5 feet 6 inches long, to the left of the three lower lines, and on the same level. This inscription is faintly cut, but distinct, and the letters seem to have been formerly painted red; it was first noticed by the present copyist in November 1853, and appears to contain a date and the names of some kings; the name "Krishna" occurs at the end of the first additional side-line. The following spaces are believed to be blank:—two in the first line, about one-third and two-thirds along it; one in the second line, about one-third along it; and one in the third line, beyond the middle. There is a great similarity between this and No. 43 inscription, which is similarly situated on the opposite cave (No. 78).

No. 16.—Two inscriptions of $5\frac{1}{2}$ and $5\frac{1}{2}$ lines, 5 feet 6 inches in length, one above the other, on the left-hand side-wall, outside the verandah of cave No. 12, and over a large recess. These inscriptions are deeply cut, and distinct where not peeled off.

No. 17.—An inscription of $2\frac{1}{2}$ lines, 3 feet long, on the left-hand side-wall of the porch to cave No. 19. It is faintly cut, and rather indistinct. There is a blank space near the end of the first line, and another in the third line between "danam" and "sahasa."

No. 18.—An inscription of one line 7 feet 6 inches long, and seven lines 3 feet 1 inch long, on the inner wall of the verandah of cave No. 29, over and between two grated windows. This inscription is deeply cut, on a rough surface, and is tolerably distinct. Dr. Stevenson's transcript does not agree with the original, in the fifth and seventh lines. There is also another short line, over one of the windows, very indistinct, and seemingly a separate inscription. No. 29 is the first in the second tier of caves, and nearly over the chaitya (No. 3).

No. 19.—An inscription of seven lines, 3 feet 8 inches long, on the right-hand side-wall, outside the verandah of cave No. 36. This inscription is faintly cut, on a somewhat honeycombed surface; and it might be supposed that the lines had originally been 10 inches longer, which portion had become quite illegible; but the word "Kaleyanakasa" being divided between the 2nd and 3rd lines, and the word "negamasa" between the 3rd and 4th, seem to disprove this supposition. The second line contains one or two of the characters recognized by Dr. Stevenson as numerals; these, and similar ones in

the next inscription, appear to be the only instances of numerals at Kanheri in inscriptions of the older class. The fifth letter in the first line may be a blank; the space in the middle of the fourth line is also probably blank; and blanks occur at the beginning and in the middle of the sixth line.

No. 20.—An inscription of probably eight lines, 3 feet 6 inches long, on the left-hand side-wall, outside the verandah of cave No. 36, and therefore opposite to the last. This inscription is faintly cut, on a honeycombed surface, and is indistinct. It evidently refers to the same subject as the last; the first two lines being probably a literal copy, and some of the subsequent words being identically the same, such as the combinations “venhuna,” and “ághyeketa.”

No. 21.—An inscription of ten lines, 3 feet long, on the left-hand side-wall, outside the verandah of cave No. 37, and near the side of a recess over a tank. This inscription is faintly cut, on a rough surface exposed to the weather, and is difficult to copy. It probably commemorates the dedication of a cave, and a tank for drinking and bathing, by some one, a householder, merchant and inhabitant of Kalyan, and by the son of some one else.

No. 22.—An inscription of one line, 15 inches long, on the rock near the entrance to the open gallery No. 38, under the south-western brow of the hill, which appears to have been a cemetery-gallery. This inscription is deeply cut and distinct; and at a little distance below

it, to the left, is this symbol  10½ inches square, and appa-

rently of the same age. The word “parigahita” may be synonymous with “parigrihita.”

No. 23.—An inscription of one line, 6 feet 9 inches long, on the back wall of open gallery No. 39. It is deeply cut, but on a honeycombed surface, and evidently commemorates the dedication of a cave to religious purposes.

No. 24.—An inscription of eight lines, over a tank-opening, on the right-hand of entrance to cave No. 43. This inscription begins with the same words as Nos. 31 and 45, and ends with the same word as No. 21; it appears to commemorate the dedication of a cave and drinking-tank.

No. 25.—An inscription of five lines, originally 3 feet 4 inches long, on the left-hand side-wall, outside the verandah of cave No. 48. This inscription is distinct, but not deeply cut; the lines are complete at the right-hand end, but the rock has peeled off at the other end; the

upper lines are more indistinct than the rest. In the second line we have "kánhasa deya dhama lena;" in the third line "pitá akhaya nivi cha diná káhápaná;" in the fourth line, "bhikhu saghe chivari;" in the fifth line, "deya dhama . . . akhaya nivi."

No. 26.—An inscription of probably nine lines, which may have been 4 feet long, on the left-hand side-wall outside the verandah of cave No. 49. This inscription is very imperfect, indistinct, and faintly cut. There are only just sufficient letters legible to determine the age of the inscription to be similar to that of the last.

No. 27.—An inscription of probably $9\frac{1}{2}$ lines, 3 feet 4 inches long, on the right-hand side-wall, outside the verandah of cave No. 52, and above a recess over a tank. This inscription is deeply cut, but on a honeycombed surface; and the upper three lines, and part of the next two, have peeled off.

No. 28.—An inscription of eight lines, 3 feet 10 inches long, on the right-hand side-wall, outside the verandah of cave No. 53, and above a recess over a tank. This inscription is deeply cut but on a honey-combed surface, and all the centre has peeled off.

No. 29.—An inscription of eleven lines, 3 feet 4 inches long, on the left-hand side-wall, outside the verandah of cave No. 56, and above a recess over a tank. This inscription is cut to a moderate depth, but is not very distinct, owing to the honeycombed state of the rock; and part of the centre has peeled off.

No. 30.—An inscription of $6\frac{1}{2}$ lines, 1 foot 7 inches long, on the pilaster at the right-hand end of the verandah of cave No. 56. It is faintly cut and indistinct; and is of a very modern date, as compared with the last; but a groove has been cut through the centre of it, at a still later date, for the purpose of fixing some wooden framing.

No. 31.—An inscription of two lines, 3 feet long, on the inner wall of the verandah of cave No. 58, and on the left-hand side of a grated window. It is deeply cut, distinct, and perfect.

No. 32.—An inscription of three lines, originally 2 feet 9 inches long, on the back wall of the recess over the tank-opening in cave No. 59. This inscription is deeply cut and distinct, but about five letters in the first line, three in the second, and two in the third, peeled off at the time the fac-simile was taken, from which Dr. Stevenson made his transcript.

No. 33.—An inscription of one line, 5 feet 3 inches long, on the inner wall of the verandah of cave No. 59, and above a small grated window. This inscription is clear, but not deeply cut, and all the letters are perfect; the three small letters, inscribed beneath the line, are also distinctly legible.

दाक्षिण्यवर्गः वरुणाक्षरं विष्णुवर्गः
 याम्यक्षरं ब्रह्मवर्गः कर्कशवर्गः
 रश्मिर्वाक्शरं शक्रवर्गः

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Nº 9.

ॐ नमो भगवते वासुदेवाय
 श्रीगणेशाय नमः
 ॐ नमो भगवते वासुदेवाय
 श्रीगणेशाय नमः
 ॐ नमो भगवते वासुदेवाय
 श्रीगणेशाय नमः

Nº 10.

ॐ नमो भगवते वासुदेवाय
 श्रीगणेशाय नमः
 ॐ नमो भगवते वासुदेवाय
 श्रीगणेशाय नमः
 ॐ नमो भगवते वासुदेवाय
 श्रीगणेशाय नमः

Nº 12.

ॐ नमो भगवते वासुदेवाय
 श्रीगणेशाय नमः
 ॐ नमो भगवते वासुदेवाय
 श्रीगणेशाय नमः
 ॐ नमो भगवते वासुदेवाय
 श्रीगणेशाय नमः

Nº 13.

ॐ नमो भगवते वासुदेवाय
 श्रीगणेशाय नमः
 ॐ नमो भगवते वासुदेवाय
 श्रीगणेशाय नमः
 ॐ नमो भगवते वासुदेवाय
 श्रीगणेशाय नमः

Nº 11.

ॐ नमो भगवते वासुदेवाय
 श्रीगणेशाय नमः
 ॐ नमो भगवते वासुदेवाय
 श्रीगणेशाय नमः
 ॐ नमो भगवते वासुदेवाय
 श्रीगणेशाय नमः

Nº 39.

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Nº 41

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ཡུལ་ ལ

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ॐ श्री ग

मृत्प्रेलकवयकात्ता तीन दस श्याग के समय प्रवतनवयविके प्र^{५६}
 उदत्तपयग ववववद्वेमावविट यमरु नयसा दीकनकी के लवलरमगममने^{५७}
 दाबदट ववेवदि कुलागुयुयाना ॥ दुम्याल्लनमेदं रीयममवप्रदमदीपरिकदिना

॥ वक ममयायवयवयुयुक्ते दयनयसक्षिता वउतिपाभनववमियनयिमुसिसपंमवकुंमंमि^{५८}
 उयमकासापमपणेयाय के ॥ यालिख पिनायाके ल सुभा मय्यममाकार सिवुमम^{५९}

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Nº 46.

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ཕུ་

Nº 48.

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Nº 47.

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Nº 49.

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 རྒྱུ་ཕུ་ཕུ་

Nº 50.

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Nº 51.

ཕུ་ཕུ་ཕུ་ཕུ་ཕུ་ཕུ་

Nº 52.

རྒྱུ་ཕུ་ཕུ་ཕུ་
 རྒྱུ་ཕུ་ཕུ་ཕུ་

Nº 53.

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 १ २ ५ १ ४
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Nº 54

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 नि३३३३अंदिं सु३३३

Nº 55.

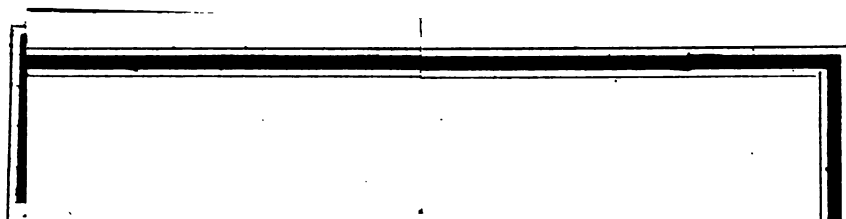
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Nº 56.

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Nº 57.

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No. 34.—An inscription of probably six lines, on the back wall of a recess over a tank-opening on the right-hand side of the entrance to cave No. 64. This inscription is faintly cut, and very indistinct; the two lower lines have wholly disappeared, and nearly half of the third and fourth lines is illegible. It commemorates the dedication of a water-tank.

No. 35.—An inscription of seven lines, on the left-hand side-wall, outside the verandah of cave No. 68. It is deeply cut and distinct, but portions of the upper lines are defaced. Compare the fourth, fifth, and part of the sixth line with the passage in inscription No. 16, beginning in the fourth line with “deya dhama.” The two dotted letters at the end, if they exist at all, are merely scratched on the rock.

No. 36.—An inscription of six lines, or more, originally 3 feet long, on the left-hand side-wall, outside cave No. 99, and above a recess over a tank-opening. This inscription is deeply cut, but is indistinct, the rock being much decayed; and about 1 foot 8 inches of the left-hand end of the inscription, and all the lower lines, have disappeared. The words “lena deya dhama” seem to occur in the third line.

No. 37.—Two inscriptions, one above the other, of seven and four lines respectively, originally 6 feet 3 inches long, on the left-hand side-wall, outside the verandah of cave No. 70. The upper inscription is deeply cut and distinct, excepting at the top and left-hand end; there is a blank space in the fifth line. The lower inscription is faintly cut and indistinct in places, the last two lines being very faint. An inscription occurs in the next cave (No. 69), but it is too illegible to copy.

No. 38.—An inscription of eight or nine lines, originally 3 feet long, on the right-hand side-wall, outside the verandah of cave No. 75. This inscription is deeply cut, and tolerably distinct, though on a rough surface; the upper two or three lines have entirely peeled off, and a considerable portion of the other lines. In the last line but one, we find the words “deya dhama lena pániya;” and in the last line, the word “bhíkhasa” occurs.

No. 39.—An inscription of nine lines, 3 feet 7 inches long, on the right-hand side-wall, outside the verandah of cave No. 76. This inscription is deeply cut and distinct, but is broken at the right-hand end, so that the last letters in each line are illegible. A peculiarity in this inscription is its separation into words, by means of blank spaces. Dr. Stevenson’s version omits the final letters in the lines, which must cause some change in the translation. The name in the top line appears to read “Dhanukakatarya.”

No. 40.—An inscription of five lines, originally 6 feet long, on the right-hand side-wall, outside the verandah of cave No. 77, and over the entrance to a side chamber. This inscription is rather faintly cut on a rough surface, and is therefore not distinct; nearly all the first line has peeled off, and about 18 inches of the left-hand end of the second line, with a corresponding portion of the following lines. In the fourth line occur the words "lena deya dhama;" and in the fifth line, "bhikha saghe pati thápit mátápitaro."

No. 41.—An inscription of ten lines, 3 feet 6 inches long, on the back of the recess over the tank, on the left-hand of the entrance to cave No. 77. This inscription is faintly cut on a honeycombed surface, very indistinct, and almost completely illegible.

No. 42.—An inscription of four letters, on the front of a pedestal, or altar, before a sitting figure, in the inner dark chamber of cave No. 78. The surface of the stone is much honeycombed, and the first two letters illegible, without a clue.

No. 43.—An inscription of two 7-feet lengths, of five lines each, on the architrave, over the verandah colonnade of cave No. 78; each length being over an intercolumniation, and the short line below being on the capital of a column. This inscription is faint and indistinct in places; and there is a great resemblance between it and No. 15, especially near the beginning; it appears to contain a date, and the names of kings, which are, however, mostly defaced; the names "Vishnu" and "Krishna" also occur. The space after the name "Vishnu" is blank; and also the two spaces just above it, and preceding "shri."

No. 44.—An inscription of twelve lines, 3 feet 9 inches long, on the left-hand side-wall, outside the verandah of cave No. 81, and over a recess. This inscription is cut rather deep, and is tolerably distinct; the last four lines being more distinct than the rest, and probably cut subsequently; the spaces in the sixth and seventh lines are probably blank. Dr. Stevenson's transcript requires several alterations, especially in the first eight lines; and the name "Nagakanda" is clearly a myth.

No. 45.—An inscription of probably more than five lines, originally 3 feet 3 inches long, on the right-hand side-wall, outside the verandah of cave No. 82. This inscription is cut rather deep, but the rock is honeycombed and weather-worn, so that the letters are very indistinct in places; about three letters are wanting at the end of the first line, and a corresponding number below. Compare the beginning with that of No. 24.

No. 46.—An inscription of eight lines, probably 3 feet 3 inches long, on the right-hand side-wall, outside the verandah of cave No. 84, and above a recess over a tank-opening. This inscription is faintly cut on a tablet surrounded by an ornamental border, the surface of the tablet being much corroded. The letters are of a peculiarly ornamental character, differing from all others at Kánheri.

No. 47.—An inscription of two unequal lines, 3 feet 11 inches and 4 feet 8 inches long respectively, above a recess over a bench, at the left-hand end of the verandah of cave No. 96. This inscription is rather faintly cut, but is distinct and perfect; many of the letters are rudely shaped. The first line appears to begin with "sidham uchasakasa vyamita putasa negamasa;" and the last to end with "deya dhama chheta diná akhayá nivi."

No. 48.—An inscription of three lines, on the face of a squared stone $19\frac{1}{2}$ inches \times $10\frac{1}{4}$ inches, found lying on the outside terrace, under the trees, in front of the chaitya cave (No. 3), and since in the possession of Dr. Wilson. As this may have been built up with other similar stones, it would be rash to read these three lines consecutively.

No. 49.—An inscription of two lines on the face of a similar, but smaller, squared stone, found near the same place as the last. This is probably a portion of the same inscription, and seems to contain a portion of the lower two lines, and at a lower level than the other stone.

No. 50.—An imperfect inscription of two lines, on the back of a bench on the north side of the nulla, opposite cave No. 7, being the remains of cave No. 94. The bench is 10 feet 6 inches long, but only 3 feet 6 inches of the end of the last line of the inscription are legible. This inscription is deeply cut, but the surface of the rock is much honey-combed and weather-worn.

No. 51.—An inscription of one line, on the front of a small low platform, cut in the surface of the rock, near the summit of the cave-hill. The platform is 6 feet long, but there are no letters on the first 18 inches. This inscription is faintly and roughly cut, and difficult to copy, owing to the complexity of the character and the similarity of the lines to the natural markings on the rock. It probably commences with "swasti shrí."

No. 52.—An inscription of three lines, 3 feet 9 inches long, on a tablet, cut on a detached rock standing between caves Nos. 21 and 22, and not far from the bund, built of squared stones, across the nulla. This bund, when perfect, was the direct route to the structural temple on the northern hill. This inscription is deeply cut and distinct; but

most of the first line, and part of the second, have peeled off. Possibly the word "taláke" may refer to the temple. It is worthy of note, that though this detached boulder appears to stand on a very insecure base, the fact of the sides of the tablet remaining vertical proves that it has not moved since the inscription was cut; so that if the rocks lying about owe their present state of confusion to an earthquake, it must have been one of very ancient date.

No. 53.—An inscription of four lines, 1 foot 4 inches long, on a tablet, cut on a detached rock, standing between caves Nos. 14 and 15. This inscription is deeply cut, but not very distinct in places; no letters are wanting. It appears to read, "Kaliyana tonadasa kamá-rasa patho deya dhama;" and perhaps commemorates the dedication of a pathway by some one of Kalyán; if so, the donor appears to have spent more money on the inscription than upon the pathway.

Nos. 54, 55, 56.—Three inscriptions of two lines, two lines, and one line, respectively, cut on the circular edges of three flat segmental stones, dug out of the ruins of the large built and sculptured dagob, in the open gallery (No. 38). The sizes of the circular surfaces of the stones are, respectively, $18\frac{1}{2}$ inches \times $5\frac{1}{2}$ inches, 20 inches \times $5\frac{1}{2}$ inches, and $21\frac{1}{2}$ inches \times 6 inches. These inscriptions are cut in fine lines upon a smooth surface; the commencement of all the lines is distinct; but the stone is corroded at the right-hand end of the second and third inscriptions. They are all probably parts of the same inscription, and the beginnings of the lines have been originally in the same vertical line. No. 54 commences with the date "Samvat 731, Ashwin Sudh 13." Another inscription has existed on one of the friezes of this dagob, alongside a sculptured representation of (probably) a human sacrifice, where some very faint traces of letters, of a more ancient form, are barely visible.

No. 57.—An inscription of $2\frac{1}{4}$ lines, 3 feet 9 inches long, on the back of a low benching, alongside the flight of steps just above cave No. 95. This inscription is deeply cut, distinct, and perfect; it appears to read, "Chemalakasa heranakasa rohani mitasa putasa dhamanakasa pátho deya dhama;" and seems to refer to the dedication of a pathway, by the brother of the donor of the tank in cave No. 7. Compare with inscription No. 13. The pathway in question consists of a long flight of steps, beginning on the side of the nulla opposite to the tank-recess (No. 5), and ascending the northern hill as far as the ruins of the great dagob.

No. 58.—An inscription of three lines, on the segmental face of a stone $8\frac{1}{2}$ inches \times $4\frac{1}{2}$ inches \times 9 inches deep, found among the ruins of the brick dagobs in the open gallery No. 38. The first two lines were very distinct, excepting the third letter in the second line; but

the lower line was much decayed. It is probable that the inscription was confined to the single stone, which was built in with the brick-work, another (plain) stone having been found thus *in situ*. From various circumstances it has been conjectured that these small brick dagobs, which are very numerous, contained the ashes of priests deposited probably in the upper part, as nothing but bricks and dust can be found below; and this inscription might settle this point. This stone appears to have been lost.

No. 59.—An inscription of four lines, painted in white, upon one face of the octagonal column, on the right-hand side of the inner doorway of the chaitya cave (No. 3). This painted inscription is very faint in places, but the date is clearly legible, especially in the afternoon, when the sun shines on the entrance to the cave. It appears that the column had formerly been covered with plaster, which has been laid over the inscription, and has tended towards its preservation. The date may possibly be read "Samvat 1210. Ashwin Sudh 1...." A very similar inscription occurs on the next face of the column, and two others on two faces of the column on the opposite side of the doorway; but all these are fainter and less legible.

No. 60.—An inscription of two lines, 2 feet 6 inches long, on the outside of the circular wall round the dagob in cave No. 13, at Mahákal, and over a grated window. This inscription is faintly cut on a smooth surface, but is distinct, except at the left-hand end, where the letters are somewhat defaced; the characters are as rudely formed as in No. 47. A copy of this inscription occurs in the fifth volume of the Asiatic Researches, but without any intimation of its locality. There has been a very long inscription of small letters, on the inner side wall of the next cave, east of the dagob cave; but only a few letters, here and there, are legible, resembling those in No. 14 inscription.

No. 61.—An inscription on a squared stone, 9 inches \times 5 inches \times 5 inches, found in a large modern temple with a tiled roof, close to the village of Devíka-pará, less than $\frac{1}{4}$ mile east of the caves of Magathán. It is a loose stone, in good preservation, and lies upon a bench inside the temple, near some modern sculptures, being smeared with red paint on the face. The temple stands on the site of a large ancient temple. The copyist has been misled, in places, by natural markings; but the inscription is clearly Buddhist, and reads, "ye dhamá hetu prabhavá hetu teshán tathágato hyavadat teshán cha yo nirodha evam vádí mahá shramana." As the chief sculpture at Magathán, though very much decayed, has evidently been a sitting figure of Buddha, there can be no doubt that these caves were Buddhist.

No. 62.—A white-painted inscription, scrawled over the back-wall of the verandah of cave No. 27 at Kánheri, between the centre and right-hand doorway; it is very faint, and the letters about a couple of feet in height. No. 27 cave is unfinished, but has been intended to be a very large vihára; the columns are similar to those of the unfinished chaitya (No. 1); and it is probable that these two caves, on the opposite sides of the hill, were being excavated at the same time.

No. 63.—An inscription on the back of a seat at the eastern end of the columned verandah at Jogeshwarí. It appears to read "gabapa-hika rá-ja," and the space between the last two letters is probably blank.

No. 64.—An inscription on the rock, to the right of the colossal figure, on the left-hand side of the entrance to the chaitya at Kondana, near the Bhore Ghaut. From the forms of the letters, it would appear to be older than the inscriptions at Kánheri.

Besides the rock-inscriptions at Kánheri there has been discovered a considerable number of seal-impressions in dried clay, differing in size, but nearly all bearing the inscription No. 61; one set of impressions bears a very minute and long inscription, ending with the words found in No. 61, but the first portion requires some clue to enable it to be read. There were also found many impressions of a figure of Buddha, surrounded by ornaments, and with the same inscription as No. 61 below the figure, very difficult to read, owing to imperfections in the original seal; these last-mentioned impressions are believed to be counterparts of those in lac, found elsewhere in India. Some copper coins were found near the same place, in stone pots, containing ashes: the coins bear an Arabic inscription, with the date 644.*

* On account of the inaccuracies in Mr. Brett's copies of the Kanheri Inscriptions, the Society has been induced to lithograph those also which have been taken by Mr. West, for besides the advantage of having been copied and reduced by the same hand (to say nothing of the Plan of the Caves "on scale," from original survey, which is added to them), they bear such signs of care and correctness in their delineation as, under the circumstances, to make the publication of the whole highly desirable.—*Ed.*

ART. II.—*Note on a Coin connected with the Sáh Inscription at Girnar. With an Impression.* By H. NEWTON, Esq., C.S.

Presented 13th December 1860.

IN the Sáh inscription at Girnar in Kathiawar, of which a fac-simile was given in the Journal of the Bombay Branch of the Royal Asiatic Society for April 1842, and translations have been published by Prinsep and Professor Wilson, the name of "Rájá Mahákshatrapa Rudra Dámá" is given as the re-builder of the bridge over the Palesini, previously repaired by the great Chandragupta.

Among the ten Sáh kings, whose coins had been discovered in Prinsep's time, one had a legend, "Mahákshatrapa Swámí Rudra Sáh, Son of Mahákshatrapa Swámí Rudra Dáma," and this latter person was assumed by Prinsep to be the re-builder of the bridge, the date of the event relatively to the line of the Sáh dynasty being thus ascertained, if the order of the series as given by him were admitted to be the correct one. But this identification was open to the objection that the king named on the coin had "Swámí" among his titles, and we find no instance in which this title was at one time assumed and at another time dropped by the same Satrap. Mr. Thomas, who has added four new kings to Prinsep's list, has, in the Journal of the Royal Asiatic Society of Great Britain and Ireland, vol. xii. p. 23, remarked as under on the defect in the identification which Prinsep proposed:—

"For the purposes of chronological arrangement it would be highly desirable to have been able definitively to determine the position Rudra Dámá should occupy among the other members of the Sáh dynasty. This might possibly have been done, but with the necessary reservation in regard to the additional prefix of Swámí, by identifying the Rájá Mahákshatrapa Rudra Dámá of the inscription with the individual of the same title and name who figures on the coins as the father of the last monarch of the present list. There is, however, undoubtedly, a difficulty in the way of the unreserved admission of their identity in the use of the extra title of Swámí on the coins for the insertion of which there was clearly no want of room

on the face of the rock whereon the inscription is engraved ; and without such a convincing degree of certainty it would, of course, be useless to raise up any arguments founded on what may eventually prove a mere chance coincidence."

And again in p. 51 :—



"But as the sovereign by whose command the Girnar bridge inscription was executed is still unidentified with any individual of whom we possess money, any detailed discussion of this subject" (the relative date of the inscription and some of the Sáh coins) "would be comparatively useless, until it is determined whether it is desirable to place the king named in the inscription *before, among, or after* the series of princes known only from coins."



The coin (see above), of which I now send impressions and casts, will set this question at rest. It was sent to me a few months ago by a friend who obtained it in Goozerat, and gives without the slightest variation the name of the re-builder of the bridge as that of the father of the Satrap from whose mint it issued.

The legend is :—

"Rájno Mahákshatrapasa Rudra Dámá putrasa rájno Mahákshatrapasa Rudra Sinhasa."

The coin is in excellent preservation, every letter being as distinct as when it left the mint. The execution too evinces a higher degree of art than that exhibited in the coins of any of the other Sáh kings, unless, perhaps, a few of Vijaya Sáh's should be excepted. But from the beautiful coin of Vijaya Sáh it differs in a very marked degree. Its characters (I take the p  and s  as examples) have the rounded outline of the cave inscriptions, to which they bear a far greater resemblance than those of any other Sáh coin that I have seen. Vijaya Sáh's, on the other hand, are remarkable for the complete transition from the rounded or broad-based rock alphabet to the pointed, lengthened, and laterally compressed character which may be looked on as the natural, though gradually perfected, result of the

attempt to adapt a character, up to that time used only for rectilinear inscriptions, to a circular legend of very small radius, where space for the lower portions of the crowded letters was, as compared with that available for the upper portions, necessarily very confined. I should on this ground infer that R. M. K. Rudra Dámá reigned, and his son's coin was struck, at a time when Greek art had but lately essayed the numismatic application of the cave character, while Vijaya Sáh, Dámajata Shri, and the great Rudra Sáh, whose coins may be taken as the perfect types of the angular adaptation, belonged to a later period, although still able to command the services of Bactrian or Greek artificers, or of others little inferior.

The date cannot be discovered, as the die of the obverse was larger than the coin. The tail, however, is visible of a figure—probably the first—nearly straight, and wanting the bifurcation or loop which distinguishes the lower termination of the numeral representing 300 (Ϟ or ϙ). If I am right in supposing that the figure spoken of occupied the first place, the second figure was probably 10 or 70.

The legend is markedly oblong—a peculiarity which I have not noticed in any other Sáh coin. The area occupied by it is also larger than that of any other well-executed coin of the dynasty that I have seen, and altogether the coin differs remarkably in appearance from all its congeners, except one to be noticed. As striking a peculiarity as any is, perhaps, that it alone, of all the Sáh coins that I have met with, gives a true delineation of the eye. The upper and lower lid and the *eye-ball* are here truthfully and artistically depicted. On the best coins of any other Satrap the eye-ball is but a linear curve, and the lines representing the eyelids usually occupy conventional positions.

The Greek legend is bold, and, as far as it falls on the coin, distinct but undecipherable. It differs from all that I can refer to. The latter half is as under—

ϞΗΛΛΗΟΝ

There is one peculiarity in the symbol on the reverse which enables me, I think, to connect this coin with another of the series. Mr. Thomas (R. A. S. Journal, vol. xii. p. 50) has remarked that to the right of the central symbol, instead of the seven stars, “at times this stellar assemblage is resolved into a single rayed star or sun.” On referring to his plates I find this variation in one coin only (pl. i. fig. 19), and that is attributed to K. Rudra Sáh, son of M. K. Rudra Sáh. The single similarly rayed coin delineated by Prinsep (Journal As. Soc.

ART. III.—*On the Sanscrit Poet, Kálidása.* By BHĀ'O
DA'JI', Esq.

Read 11th October 1860.

KĀ'LIDĀSA is justly regarded as the greatest of Indian poets and dramatists. His works have been translated not only into some of the vernacular languages of India, but within the last seventy-one years into English, German, French, Danish, and Italian. They are read in the original Sanskrit with greater critical acumen, and in the translations delight a larger number of readers in Europe than in the birth-land of the poet.

Native poets, commentators, and critics are lavish in their praises of Kálidása; and it is not a little to his honor that the orientalist Jones, Wilson, Lassen, Chezy, Williams and Fauche, but also that the poet, critic, and natural philosopher,—Goëthe, Schlegel, and Humboldt respectively, have assigned him a very high position amongst the glorious company of the “Sons of Song.”

The four well-known lines of Goëthe in praise of S'akuntalá* may here be repeated :—

“Would'st thou the young year's blossom and the fruits of its decline,
And all by which the soul is charmed, enraptured, feasted, fed?
Would'st thou the earth and heaven itself in one sole name combine?
I name thee, O Sákuntalá! and all at once is said.”

Alexander Von Humboldt says :—“Kálidása, the celebrated author of the S'akoontalá, is a masterly describer of the influence which nature exercises upon the minds of lovers. This great poet flourished at the splendid court of Vikramáditya, and was therefore contemporary with Virgil and Horace. Tenderness in the expression of feeling and richness of creative fancy have assigned to him his lofty place among the poets of all nations.”

Professor Lassen, in his “Indische Alterthumskunde,” that wonderful and unrivalled monument of literary and antiquarian research, observes :—“Kálidása may be considered as the brightest star in the firmament of Indian artificial poetry. He deserves praise, on account of

* S' stands for “Sh.”

the mastery with which he wielded the language, and the fine sentiment with which he imparts to it a simpler or more artificial form according to the subjects of which he treats without falling into the later hair-splitting and overstepping of the boundaries of good taste; on account of the multifariousness of his creations, his ingenious invention and happy choice of subjects; on account of the complete fulfilment of his poetical intentions; and on account of the beauty of his representations, the tenderness of his feeling, and the richness of his imagination. This praise is mostly deserved by his two Dramas, the *S'akuntalá* and the *Vikrama Urvas'i*. In the composition of these pieces he had only listened to the inspirations of his highly-gifted and conscious spirit, and he shows himself entirely independent of the influence of the school from which *Bhavabhúti*, who lived about A. D. 710, could not withdraw himself."*

About seventy-five years ago, Sir William Jones introduced *Kálidása* to the notice of the European literary public, by his elegant translation of the drama *S'akuntalá*. Professor H. H. Wilson gave a charming translation of the *Vikrama Urvas'i*, the "Hero and Nymph," the twin-play of *S'akuntalá*, in his well-known and esteemed work, the "Hindu Theatre," in 1837. The Sanskrit text, with a Latin translation, &c., was published at Berlin by R. Lenz, in 1833. Hirzel published a German translation also in 1833; F. Bollensen at Petersburg in 1846. The Sanskrit text, edited by M. Williams, was published at Hertford in 1848, and a prose translation by E. B. Cowell in 1857. The Sanskrit text of the *Megha Duta*, or "Cloud-Messenger," with an admirable metrical translation into English, interspersed with many learned notes, was also published in 1832, by the late Professor H. H. Wilson, who combined with profound knowledge of every branch of Sanskrit literature, poetical talent of no ordinary character. This episode has also been edited by Professor Johnson in England, by Mr. J. Gildemeister with the *Sringára Tilaka* at Bonn in 1841, and by Dr. Max Muller at Königsberg. An edition, with Mallinátha's Commentary, has been published at Benares, and the text forms a part of Hœberlin's *Sanskrit Anthology*, which also contains *Kálidása's S'ritabodha* and *Ritu Sanhára*. The *Ritu Sanhára* has been edited and translated by Bohlen, at Leipzig, in 1840; and the *Sritabodha* by M. E. Lancereau, at Paris, in 1855.

The "*Raghuvans'a*," a heroic poem, was translated into Latin by Adolphus Fredericus Stenzler, and published in Paris* in 1832. A translation into modern Greek was published by Mr. Typaldo, at Athens, in 1849. A metrical translation of the first book, by the Rev.

* Lassen's *Alterthumskunde*, Band. ii. p. 1158.

J. M. Mitchell, appears in our Journal for 1843, and an analysis of the whole work by the Rev. J. Long, in the Journal Beng. A. Society for 1852. A. F. Stenzler published in 1838, in Sanskrit and Latin, the first seven Cantos of the Kumára Sambhava, or "Birth of the War-God," which has also been rendered into English verse by Mr. Ralph T. H. Griffith, and published under the patronage of the "Oriental Translation Committee" in London, 1853. Of this beautiful poem, Mr. Griffith observes that, "The Birth of the War-God was either left unfinished by its author or time has robbed us of the conclusion. The latter is the more probable supposition, tradition informing us that the poem originally consisted of twenty-two cantos." In our search throughout Gujarat and the Deccan for ancient manuscripts, we have been fortunate enough to get three venerable copies of the entire poem, and a fourth one of the 8th, 10th, and 11th chapters, and we intend to take an early opportunity of publishing the complete work in Sanskrit, with another poem of Kálidása in Mágadhí, (the Setu Kávyā), which has never been brought to the notice of the learned world.

The S'akuntalā, considered the gem of oriental literature, has been excellently translated into English prose by Professor Monier Williams, and published in a superb form in 1853 by Mr. Stephen Austin, who, "with an almost lavish liberality, has done everything to make the vehicle worthy of its contents."

Another edition (1853) with the Devanāgarī recension, literal English translation, and critical and explanatory notes, is still more valuable to the student of Sanskrit.

In 1842, Otto Böhtlingk edited the Devanāgarī recension of this play at Bonn. A German version of Sir William Jones's English translation was published by Forster in 1791; and versions of the English have appeared in Danish and Italian. This play, which inspired Goëthe with rapture, led Chezy to learn Sanskrit. Chezy put it into French; Hirzel, Bœhtlingk, Ernst, Meier, and Lobedanz, succeeded one another in rendering it into German prose or verse. Sanskrit editions of the play in Bengali and in Devanāgarī characters have been published in Calcutta, the last (Gaudīya recension prepared by Prema Chundra Tarka vāgīsha Bhattāchārya and edited by E. B. Cowell) only a few months ago.

The first volume of a translation of the complete works of Kálidása, by M. Hippolyte Fauche, appeared last year (1859), and besides the second volume, the author promises an "*Etude*" on the life and works of the Indian Bard.

The Poona Sanskrit College published some years ago an

indifferent edition of the *S'akuntalā*, a few loose cantos of the *Raghuvans'a*, and a single one of the *Kumāra Sambhava*. The Sanskrit text of the *Mālavikāgnimitra* by O. F. Fullbery, and of the *Nalodaya* by F. Benary, two works attributed to Kālidāsa, were published at Bonn (1840) and Berlin respectively; also a German translation of the former by A. Weber, at Berlin, in 1856.

What, then, is the personal history of the poet, whose works are regarded as so classical, and command the esteem of the learned of all nations, and whose productions have been the subject of so much critical acumen and learned elucidation?

Even the most accomplished of his native commentators, who is undoubtedly Mallinātha,* preserves a painful silence as to the personal history of the poet; and the most eminent orientalists have been compelled to admit, with regret, that not only no connected history of the life of Kālidāsa, and, indeed, of any of the other Sanskrit dramatic poets, can be furnished, but that there is considerable difficulty also in ascertaining the precise time at which the great poet lived.

The title of the Indian Shakspeare has been assigned to Kālidāsa on the authority of that prince of critics, Sir W. Jones. In the case of both Kālidāsa and Shakspeare, it may justly be observed that "their lives remain almost a blank, and their very name a subject of contention."

All that is generally known of Kālidāsa may be stated in a few words. He lived in Ujjayinī or Ujjein, and was the noblest of the nine men of genius who graced the court of Vikramāditya. A memorial verse gives the names of these nine "Gems" as follows:—

"Dhanwantari, Kṣāpanaka, Amara Sinha, S'anku, Vetālabhatta, Ghatakharpāra, Kālidāsa, the renowned Varāha Mihira, and Vararuchi, are the nine gems of Vikrama."

Of these the most celebrated are said to have been the physician Dhanwantari; Amara Sinha, the lexicographer; Varāha Mihira, the astronomer; Vararuchi, the poet and linguist; and Kālidāsa, the poet and dramatist,—the brightest of them of all.

The word Vikramāditya signifies "Sun of Valour," and was assumed by many kings of Ujjayinī and of other kingdoms of India.

The Vikramāditya, at whose court the great Kālidāsa flourished, is generally believed to be the king who, after defeating the Sakas or Scythians, established the Samvat Era, which commences fifty-seven years before Christ.

* The age of Mallinātha himself is not clearly established. Mallinātha states that he wrote his Commentary after consulting those of Dakṣiṇāvarnātha and others. He lived some time after the 14th century.

Sir William Jones, conceiving the Vikrama mentioned in the "memorial verse" to be the same as the founder of the Samvat Era, places Kálidása in the century preceding the Christian Era. Many eminent Orientalists have followed him in this opinion. He has thus come to be regarded as the contemporary of Horace and Virgil,—the reign of Vikramáditya at Ujjayiní rivalling in brilliancy that of Augustus at Rome.

Mr. Bentley, on the authority of the Bhoja Prabandha* and the Ayeen Akbari, supposed the patron of learning to be the same as "Rájá Vikrama, successor to Rájáh Bhoja," in the eleventh century of the Christian Era. Col. Wilford and Mr. James Prinsep place Kálidása in the 5th century, and Mountstuart Elphinstone adopts this date in his admirable History of India. In Gujarat, Malwa, and the Deccan, Kálidása is believed, chiefly on the authority of the Bhoja Prabandha, to have flourished at the court of Bhoja, the nephew of Munja, at Ujjayiní, in the 11th century of the Christian Era. There have been several Bhojas as well as Vikramas or Vikramádityas at Ujjayiní, the last Bhoja having flourished in the 11th century of the Christian Era; and to reconcile the two suppositions, it is necessary to suppose that the Vikrama or Vikramáditya, at whose court the "nine" learned men flourished, was also styled "Bhoja."

Professor Lassen assumes Kálidása to have flourished in the second half of the 2nd century after Christ, at the court of Samudragupta, chiefly on account of the designation, "friend of poets," applied to that king in inscriptions.

Mons. Hippolyte Fauche, who, it appears from the "Saturday Review" of January 1860, has published a French translation of the complete works of Kálidása, supposes the poet to have lived at the time of the posthumous child, who is said, at the end of the last canto of the Raghuvans'a, to have succeeded to the throne.

This would place Kálidása, at the latest, in the eighth century before Christ. Mons. Fauche thinks there is nothing so perfect in the elegiac literature of Europe as the "Megha Duta" of Kálidása.

Professor Wilson avoids giving any decided opinion regarding the exact age of Kálidása, but it is clear that he had grave doubts respect-

* M. Theodore Pavie has published the Bhoja Prabandha with a French translation and occasional comments, in the *Jour. Asiatique*, t. iv, sér. 3e, p. 210 *et seq.*

This work is entirely untrustworthy, and has contributed much to mislead the early inquirers into Indian Antiquities. It is now scarcely necessary to point out all the errors of a book the compiler of which, ignorant alike of history and the true character of his heroes, was only bent on producing a light work to suit a modern, degenerated taste.—*Author.*

ing the contemporaneous existence of the poet with the Vikrama of the Samvat Era.

Colonel Tod, in "the Annals of Rajasthan," vol. i. p. 92, observes, "While Hindoo literature survives, the name of Bhoja Pramāra and the nine gems of his court cannot perish; though it is difficult to say which of the three princes of his name is particularly alluded to, as they all appear to have been patrons of science." In a note, the learned Colonel gives,—Samvat 631 (A. D. 575), Samvat 721* (A. D. 665), and Samvat 1100 (A. D. 1044), for the first, second, and third Bhojas respectively.

There are good reasons for accepting the above dates as correct. A Vriddha or older Bhoja is described in several Jain works as having had for his spiritual adviser, Mānatunga Sūri, about the second or third century of the Christian Era, calculating from the lists of Jain hierarchs; but there is evidently some mistake here. Mānatunga was, according to some Jain authorities, a contemporary of the poets Bāṇa and Mayūra, but these two last undoubtedly lived at the beginning of the seventh century, as Bāṇa, in one of his rare productions in Sānskrit, called the "Harsha-charita," describes his visit to Harsha-Vardhana, king of S'rikantha. There is abundant evidence to prove that this king, Harsha-Vardhana Silāditya, is identical with the Silāditya of Kanoge, who honoured the celebrated Chinese Buddhist traveller Hiouen-Thsang. Indeed, the Indian poet and the Chinese traveller relate the history of the king with so much similarity, that one would be disposed to believe that Bāṇa wrote the Harsha-charita after reading the historical notes of the Chinese traveller; and there is a singular passage in the work which would give a colouring to this supposition, in which Bāṇa speaks of the Yavana-prayukta-purāṇa.

In looking carefully over the various legends regarding Vikrama, as given in the Vikrama-charita; in the Sinhāsana dwātrinsāti; in the Vetāla panchavins'ati, an essay on Vikrama and Kālidāsa by Merutunga; in the Prabandha Chintāmaṇi;† as well as in another called Chaturvins'ati-prabandh'a, by Rājas'ekhar'a, it appears tolerably clear that the Vikramāditya, who founded the Samvat Era, or from whom it has its origin, was a just, brave, liberal and ambitious prince; but

* We possess a list of remarkable events, compiled by a Jain priest, in which a Bhoja is said to have "peopled" Ujjayini in Samvat 723.

† As it is desirable to place before the public the fullest information procurable regarding all authors who assumed the name of Kālidāsa, we have added translations of this and the following essay and of other stories, as appendices,—on account of their great length.

that he was the patron of arts and sciences is nowhere clearly stated or implied. Jain records mention Siddhasena Sūri, a learned Jain priest, as the spiritual adviser of this Vikramāditya.

Since the above remarks were written we have received a complete copy of the Kathā Sarita Sāgara, and going carefully over the stories of Vikramāditya, we were surprised to find in the 18th section, the statement that they had been related by the sage Kapva to the king Naravāhanadatta of Kaus'āmbī in Vatsa. This Vikramāditya, the hero of many interesting fables, appears after all, to have flourished previously to the 5th century before Christ, i.e. before Naravāhanadatta, who, according to many Jain authorities, the Kathā-sarita-sāgara and the Matsya Purāṇa, was the grandson of Sātānika,* the contemporary of Mahāvīra and Ś'akya Sinha. One of the ancient Nassick cave-inscriptions has a Vikramāditya, celebrated for his glorious deeds in the company of Nabhāga, Nahusha, Janmejaya, Yayāti, and Balarāma.† Thus it is clear that popular ignorance has assigned to Vikramāditya of the Samvat Era, glories to which he is not entitled. The whole subject is so complicated yet interesting, that we shall take an early opportunity of clearing up the history of the "Vikramādityas."

In the Vikrama Charitra, composed by S'ri Deva, of which the MS. in our possession was copied in Samvat 1492 (i. e. A. D. 1435), it is stated that 470 years after the nirvāṇa (death) of Vardhamāna, the last of the Jain Tirthankaras, Vikramāditya flourished in Viś'ālā (Oujein) in Avanti Des'a. He released his subjects from debt and established his own era. There is no allusion to Kālidāsa.

Except the Jyotirvidābharaṇa, a Sanskrit treatise on astrology, ascribed in the concluding stanzas to Kālidāsa, we have not met with any work, in the Sanskrit or Māgadhī language, noticing the contemporaneous existence of the "nine gems" at the court of Vikramāditya of the Samvat Era. There are several works which mention a Vikramāditya or Bhoja in connection with the patronage of letters and arts; and particularly of Kālidāsa; but the omission of any distinctive appellation leads to the inference that the patron of Kālidāsa and other learned men was a later monarch of that name, who was also styled Bhoja.

The conclusion to the Jyotirvidābharaṇa, which contains the verse respecting the "nine gems" so frequently quoted as a "memorial verse," without any one having been able to trace it to its source, is given entire below, as the author enters into chronological details regarding himself not met with in any of the well-known works of the great Kālidāsa.

* Wilson's Vishnu Purāṇa, p. 462.

† Journal of the Bombay Branch Royal Asiatic Society, vol. v. p. 43.

Translation of Chapter 22, containing twenty-one Verses.

1. I now proceed to give in order the subjects already treated of, and to describe the joy-producing monarch, Vikrama.

[The 2nd to the 6th verse contains the names of the subjects, and the 6th verse states that the total number of verses in the book are 1,424, and that the book is named "Jyotirvidābharāṇa Kāvya."]

7. By me has this work been produced in the reign of Vikrama over Málava in Bhárata Varsha, which is rendered delightful by the study of the S'r̥itis and Smritis, and which contains 180 countries.

8. S'anku, Vararuchi, Maṇi, Ans'udatta, Jishnu, Trilochana, Hari, Ghatakharpara, also Amara Sinha and other poets, adorned his assembly.

9. Satya, Varāha Mihira, S'rita Sena, S'ri Bádaráyaṇi, Maṇittha, and Kumára Sinha, were the astronomers, and myself and other professors of astronomy also.

10. Dhanwantari, Ks'apaṇaka, Amarasinha, S'anku, Vetālabhatta, Ghatakharpara, Kálidása, the renowned Varāha Mihira and Vararuchi, are the nine gems of Vikrama.

11. Vikrama flourished, and at his court attended 800 Mándalika (minor) Rajas; and at the great assembly there were 16 eloquent pundits, 10 astronomers, 6 physicians, and 16 reciters of the Vedas.

12. His army occupied 18 yojanas of ground; his forces consisted of 3 crores of infantry, 10 crores of cavalry, 24,300 elephants, and 400,000 boats. No monarch could be compared to him.

13. He celebrated his victory over the world by the destruction of ninety-five S'aka chiefs, and established his era in the Kaliyuga; and by daily giving in alms, pearls, gold, jewels, cows, horses and elephants, he brightened the face of dharma.

14. He destroyed the proud king of Dravida, also the king of Láṭa, defeated the king of Gauda, and conquered him of Gurjardes'a, removed the darkness of Dhárá, delighted the king of Kámboja, and conducted himself with success.

15. His prowess and qualities were like those of Indra, Ambhodhí, Amaradru, Smara, and Meru. He was the delight of his subjects, and humbled his enemies by conquering and restoring their forts to them.

16. He protects the capital Ujjayiní, the great city which gives beatitude to its inhabitants, and which is celebrated for the presence of Mahákála.

17. In a great battle he conquered the king of the Sa'kas in Ruma, paraded his royal prisoner in Ujjayiní, and afterwards set him free. Such was his irresistible prowess.

18. Whilst Vikrama thus reigned in Avantī, the people enjoyed prosperity, happiness, and wealth, and the injunctions of the Vedas were everywhere observed.

19. S'anku and many other pundits and poets, and Varāha Mihira and other astronomers, flourished at his court. They respect the genius of me, who am a friend of the king.

20. Having first composed three Kāvya, i. e. the Raghuvansā and others, I composed several treatises on Vedic subjects (S'riti Karma-vāda) ; then from Kālidāsa proceeded the astrological treatise called Jyotirvidābharaṇa.

21. 3068 years of Kali having passed, in the month of Vys'ākha I commenced composing the work, and completed it in the month of Kārtika. Having zealously examined many astronomical works, I have composed this treatise for the edification of astronomers."*

In verse 46 of the 20th chapter he says:—

“The people of Kamboja, Gauda, Andhraka, Mālava, Surājya, and Gurjara, sing even to the present day the glory of Vikrama, shining with the liberality of gifts of gold.”

The existence of so distinct a statement in an astrological work of some pretensions to antiquity would have set the question of Kālidāsa's epoch at rest, but from a careful examination of its style, and from other internal evidence, it does not appear to be the production of the great Kālidāsa.

In furnishing a rule for finding out the Ayanāns'a (the arc between the vernal equinoctial point and the beginning of the fixed Zodiac or first point of Aries) we are told in the work that from the number of years after Saka (i. e. the era of Śālivāhana, A.D. 78), 445 years should be subtracted, and the remainder divided by 60. This alone proves that the treatise was written at least seven centuries after the Vikrama Samvat, and there is abundant evidence to prove that the real author was of the Jain persuasion. Also as Jishnu, the father of Brahmagupta,†

* For the original Sanskrit text, see Appendix.

† Brahmagupta gives the following date for the composition of his Siddhanta, of which we possess an excellent manuscript copy made in Samvat 1678.

श्रीचापवंशतिलके श्रीव्याघ्रमुखेनृपेशकनृपालात् ॥ पंचाशत्संयुक्ते वर्षशतैः पंच-
भिरतीतैः ॥ १ ॥ ब्राम्हः स्फुटसिद्धांतः सज्जनगणितज्ञगोलवित्कील्यै ॥ त्रिंशद्द-
र्षेणकृतो जिष्णुसुतब्रह्मगुप्तेन ॥ २ ॥ अध्याय २४—आर्या ७-८

Translation.—“In the reign of Shri Vyāghramukha, of the S'ri Chāpa dynasty, five hundred and fifty years after Saka king (i. e. Śālivāhana, or A.D. 628) having

is stated to have graced the court of Vikramāditya in addition to the "nine gems," it is clear that the author of the *Jyotirvidābharaṇa* is sufficiently modern to have confounded Harsha Vikramāditya of Ujjayinī, in the 6th century, with the founder of the Samvat Era.

The "memorial verse" so often quoted by learned men in proof of the existence of the "nine gems," at the court of Vikrama, thus loses completely its value as an authority. Besides, it is very doubtful whether there was any poet with the appellation of Ghatakharpara, the *Kāvya* bearing that title in many manuscripts being attributed to Kālidāsa.

Another writer, who assumes the title of Kālidāsa, is the author of *S'atruparābhava Grantha*, an astrological work treating of favourable opportunities for action, by determining the predominance of "svara" or breath, through the right or left nostril.

The first and last verses are as follows:—

नत्वा सुरासुरशिरोमणिरत्नरश्मिचित्रीकृताघ्रियुगलं हरिमादिदेवं ॥ श्रीकालिदासगणकः स्वरशास्त्रसारं वक्ष्याम्यहं प्रबलशत्रुपराभवाख्यं ॥ १ ॥

आसीत् कश्यपवंशजोर्कृतनयातीराधिवासीदिजः श्रौतस्मार्तविचारसारचतुरः श्रीभानुभट्टसुधीः ॥ तत्पुत्रोहरिभक्तिनिर्मलतनुर्ज्योतिर्विदामग्रणीः शास्त्रं शत्रुपराभवाख्यमकरोत् श्रीकालिदासः कविः ॥ २ ॥

Translation.—"I, Kālidāsa Gaṇaka, after making obeisance to Hari, the Adi Deva, whose joint feet are resplendent with the rays of the jewels in the crowns of the Gods and Demons, proceed to give the substance of *Svara S'astra*, called *S'atruparābhava Grantha*.

"Deeply versed in the knowledge of the *S'ritis* and *Smritis*, and born in the race of *Kas'yapa*, there lived on the banks of the *Arkatanayā* (*Jumna*), the talented *Bhānubhatta brāhmaṇa*. His son, whose body has been purified by devotion to Hari, is the poet Kālidāsa, the first among astrologers. He composed the *S'astra*, called *S'atruparābhava*."

In the following (30th) verse, he says:—"To the current Saka year add 12 and divide the sum by 60, the remainder is the year of the human cycle and the eleventh from it is the order of the *Barhaspatya* cycle," (i. e. the cycle of Jupiter).

शकेसार्कैर्बतेखणिः शेषेन्दः प्रभवादिकः

मनुष्यमानतः स्तस्माज्जैवः स्यादीशसंमितः ॥ १ ॥

passed, Brahmagupta, the son of Jishnu, at the age of thirty, composed the *Brahmagupta Siddhānta* for the edification of mathematicians and astronomers." Chap. 24. Aryā 7-8.

He invokes Ganpati and then Vishnu. It is clear that he lived long after S'alivāhana; and the style shows that he is not the author of the S'akuntala and Raghuvars'a.

Colonel Wilford, in an elaborate essay on Vikramāditya and S'alivāhana, gives a large collection of ill-digested facts, with his usual proportion of the wildest speculations on them; but it is not necessary to point out here all the mistakes that are patent to us, so that we shall deal only with those that relate immediately to the subject under consideration. Thus he writes:—"In the Satrunjaya Mahātmya we read that after 466 years of the era are elapsed, then would appear the great and famous Vikramāditya; and then, 477 years after him, Sailaditya or Bhoja would reign.

"In the Ayeen Akbari, the various dates from the era of Vikramāditya are to be reckoned from the accession to the throne, in the middle ages of the Christian Era."*

The S'atrunjaya Mahātmya is a Jain work, an abstract of which in the original Sanskrit, with a German translation, has been published by Weber (Leipzig, 1858). It professes to be the composition of Dhanes'wara Sūri, at the request of a S'ilāditya of Valabhī, glorifying the S'atrunjaya mountain, which is the same as the hill of Palitāna in Kattiawar. The original passage is as follows:—

अस्मन्निर्वाणतोवर्षैस्त्रिभिः सार्द्धेषु मासकैः ॥ धर्मविप्लावकः शक्रः पंचमारो
भविष्यति ॥ १ ॥ ततः शतैश्चतुर्भिः षट्षष्टिभिर्वत्सरैर्दिनैः ॥ पंचचत्वारिंशता-
पि विक्रमाकौर्महीमिमां ॥ २ ॥ सिद्धसेनोपदेशेनानृणीकृत्यजिनोक्तवत् ॥ अस्म-
त्संवत्सरं लुप्त्वा स्वीयमाविष्करिष्यति ॥ ३ ॥ इति शत्रुंजयमाहात्म्ये १४ सर्गेः†

Vira, i. e. Mahāvīra or Vardhamāna, the last of the Jain Tirthan-
karas says:—

Trans.—"Three years and five months and a half after my nirvāna (death) there will be produced an Indra, a destroyer of religion. He will be called a fifth Māra (killer). Four hundred and sixty-six years and forty-five days after him, Vikramārka Raja, honouring the advice of Siddhasena Sūri as the words of Jina, will free the earth from debt, and, setting aside the current era, will establish his own."

It is clear then from this text, which we have collated with three old MSS. in our possession, that the Samvat Era replaced that of Var-

* Asiatic Researches, vol. ix. p. 142. The same opinions are repeated at p. 156.

† Ueber das Satrunjaya Mahātmyam von Albrecht Weber, Leipzig, 1858. p. 92. Weber's text has सार्धाष्ट मासकैः which would make a difference of three months.

The text we have quoted is from two admirable manuscripts in our possession.

what I have to offer for the use of others for this purpose, or for my own use on some future occasion, as the case may be."

Needing no other introduction than this then, I will only further premise, (as much of what I have already stated has been denied), that, in my "Paper" of 1852, on the structure of *Operculina Arabica*, to which was added an illustration of an infiltrated Nummulite (*N. acuta*), showing that the canal-system was the same in both, I observed, that the former would "elucidate all that has hitherto been stated of, and leave little to be added to, the general structure of foraminiferous shells both recent and fossil," and I am glad to be able to add now, viz. ten years since this observation and my description of the structure of *Operculina* were written, that I have not stated in either anything which I wish to recall. Since then, however, Ehrenberg has confirmed what I have described and illustrated respectively, of the canal-system in *Operculina* and *Nummulites*, viz. in *Nummulites striata*, in 1855;* and lately, I have been able to repeat this myself most satisfactorily in another of the "Striatæ," viz. in *N. Ramondi (mihi)*, as I shall show hereafter.

I would also mention here my regret, that in my "Paper" on the structure of *Operculina Arabica*, I did not observe that Professor Williamson had previously pointed out the existence of the canal-system in part, viz. in the marginal cord of *Nonionina*.† This arose from ignorance of the fact, for I never could, and never have been able even up to this day, to obtain the volume of the Transactions of the Microscopical Society of London, (1st Ser. vol. iii.), in which it was published. While that on *Faujasina* by the same author, which points out the "intra-septal canals" of this system, although read in 1851, was not published by that Society until 1853 (2nd Ser. vol. i.), that is a year after my "Paper" on *Operculina Arabica* appeared in the "Annals and Magazine of Natural History," and hence the reasons for Professor Williamson's discovery having been omitted.

Further Observations on the Structure of Foraminifera.

OPERCULINA, d'Orbigny.

In Dr. Carpenter's elaborate and valuable "Paper" on the structure of this genus, taken from specimens of *Operculina Arabica* originally obtained from the Philippine Islands, he has made an important addition to what I have stated on the subject in one respect, and anything

* *Ap. Dr. Carp. Phil. Trans.*—1859, p. 28.

† *Id. id.*

but one in another ; inasmuch as he has denied the spicular structure of the marginal cord, which is one of the most palpable objects in the test.

The important fact that he has added, is the discovery in the canal-system, of a main spiral trunk, which commences with the spire in duplicate (that is, one in each horizontal half of the test), and follows it to its termination. These two large trunks, to which Dr. Carpenter has applied the name of "spiral canals," he states, "though only running along the angles of the marginal cord, pretty obviously communicate with the plexus of passages which it contains ; and thus the interseptal system of one whorl is brought into direct connexion with that of the preceding."* To complete this description, I would add that, in the first two or three turns, the interseptal canals form a *direct* bond of union between the spiral canals ; and afterwards only by some of their branches ; as the interseptal canals go to the inner side of the marginal cord where they divide into branches, and the great spiral canals remain continuous outside, at the point of junction of the spiral lamina and the cord.

I had observed these canals, as may be seen by my illustration (fig. 5, *loc. cit.*), where the interseptal canals of the outer whorl are represented as springing from one of them, but had not specially recognised them as they deserved, and as has now been very fortunately done by Dr. Carpenter. But MM. d'Archiac and Haime had recognised and figured them without knowing what they were even before this, in *Nummulites planulata*, (pl. ix. fig. 7, and p. 63,) where they state, with reference to "the grooves" in the marginal cord, "*Une seule espèce (N. planulata) offre de chaque côté de bourrelet un sillon environ cinq fois plus large que tous les autres. Les canaux moyens s'ouvrent presque toujours dans ses sillons.*" No doubt, therefore, exists in my own mind, from having also seen them in a closely allied nummulate, viz. *N. Ramondi*, that the "sillons" represented in the figure mentioned, are the "spiral canals" described by Dr. Carpenter in *Operculina*.

On the other hand, the more important fact which Dr. Carpenter has failed to recognise after my description of it, is the spicular structure of what he terms the "marginal cord," which had been previously named by myself the "spicular cord," to denote its peculiar composition, and under which appellation, although I like the former name much, I must still continue to allude to it.

* Phil. Trans.—1859, p. 28

I need hardly quote all that Dr. Carpenter has stated respecting the structure of this part of the test of *Operculina*. Suffice it to notice that, he considers its structure homogeneous and not spicular. Thus, he observes :—"the supposed spicular composition of this 'marginal cord ; (as it may be appropriately termed) is due to the peculiar manner in which the homogeneous substance of which it is composed is traversed by the set of canals that are correctly described by Mr. Carter as forming the 'marginal plexus.'"*

Now I would rather not have had to repeat what I stated respecting the structure of this cord ten years since, and I feel certain that had Dr. Carpenter taken a favourable specimen of *Operculina*, and with a small sharp scalpel had cut off tangentially portions of this cord, there would have been no occasion for it. However, these subjects seldom lose by a second investigation, and the result of mine in this instance is, that I am not only more convinced of the spicular structure of the cord than ever, but am now able to describe its composition much more definedly than has hitherto been done.

Thus, this cord which is almost semi-circular, with the arch or convex part outwards and the chord or base within, is composed of—1st, spicules, 2nd, an inter-spicular substance, and, 3rd, a plexus of anastomosing canals.

The spicules are semi-transparent, homogeneous, crystalline, calcareous bodies, more or less fusiform in shape, and arranged one above another irregularly and interdigitatingly, in horizontally inclined planes, which, like the leaves of a book when open, radiate partly from the centre of the "chord" and partly along this chord on either side ; that is to say, they do not all radiate from a common point ; while there are also a certain number of semi-planes at the circumference, which fill up the intervals formed by the radiating of the whole-ones.

The inter-spicular substance is an areolar, calcareous, membranous structure, which unites the spicules together and the planes to each other respectively. It resembles, and is analogous to, the albuminous tissue which surrounds and unites the spicules together in the spiculiferous Sponges.

Lastly, the plexus of anastomosing canals consists of reticulated planes of these canals which lie between the planes of the spicules ; the canals of which anastomose with each other through the spicular

* Phil. Trans.—1850, p. 25.

planes; communicate with the interseptal canals; and open on the surface of the cord respectively.

In some, if not in all, specimens, the spicules not only exist throughout the cord (for they can be seen on its inner aspect where the cord is in contact with the outer margin of the chambers), *but are continued down over the interseptal spaces even to the innermost turn.*

Now, if the substance of the cord were homogeneous, the structures mentioned in it could not be defined. If it were simply the "peculiar manner" in which its homogeneous substance were "traversed by the set of canals" which it contains, as stated by Dr. Carpenter, then portions of the cord on transverse fracture could not be made to present the ends of spicules at the fractured points, nor could portions of the cord fall out on fracture longitudinally, in the form of spicules. Nothing but certain portions of the cord being harder than the rest, and of these portions being of a spicular form, could give rise to either of these appearances. While, if it be the "peculiar manner in which the homogeneous substance of which it is composed is traversed by the set of canals," which gives the cord an appearance of spicular structure, how is it that this spicular appearance exists over almost all the interseptal spaces of some specimens, where there is no plexus and no canals but those which pass through it almost perpendicularly? It is, however, useless to have recourse to argument for conviction when the fact can be demonstrated, so we will turn our attention to another point in the economy of this shell, viz. the "canal-system."

As regards the use of the canal-system, nothing yet has been definitely assigned. I thought formerly that it subserved the purpose of a water-circulation as in Sponges, viz. the water going in by the ends of the small canals which open on the horizontal surface of the test, and coming out through the orifices of the larger ones on the surface of the spicular cord, and I now think that this may be a part of their function, at the same time that they may draw in nutritious particles by the small pores also like the Sponges. The anastomosing canals, like also in appearance and function to the mycelium of Fungi, serve to convey portions of the sarcode (upon which the canals themselves are first moulded) to the points from which new portions of the organism are to be developed; while they undoubtedly too, in part, perform the office of excretory channels, for in the recent and living specimens of *Operculina Arabica* (which I obtained on the coast of Arabia), the sarcode of the interseptal canals remains, after the calcareous matter

of the test has been removed by acid, in connection with the membranous chambers, by short branches, through which globular bodies (to which I shall more particularly allude presently), which are more or less present in the chambers, readily pass, on pressure, into the larger interseptal canals; and again through these, probably by the openings on the spicular cord, during the living state, they would have obtained an exit. That the sarcode of the canal-system also carries on the development of the organism independently of the chambers, is proved by the development of the test continuing after the chambers have ceased to be formed,—as will be hereafter mentioned.

Lastly, the substance covering the horizontal surface of the test, which I have likened to the cuticle of shells, in accounting for the formation of the horizontally laminated structure of the test, and have inferred to be connected with the sarcode of the chambers through the vertical tubuli of the test, MM. d'Archiac and Haime have more properly likened to the "épiderme des échinides ou de l'épithèque des polypes" (p. 69). But what I meant is seen by the context in my "Paper" viz. that, in its dry state, it was merely like the cuticle of shells in appearance and not identical with it.

Of this substance Dr. Carpenter states nothing in his "Paper" on *Operculina*; but in his description of *Orbitolites* he observes, in a "foot-note" (p. 207), "I have little doubt that 'the greenish' cuticle described by Mr. Carter as covering his *Operculina Arabica*, and supposed by MM. d'Archiac and Haime to be specially connected with the formation of the shell, is of the same nature," that is, of the nature of "a covering of vegetation, chiefly composed of Diatomaceæ, Dismidiæ, and other minute Algæ." To which I must simply reply, that, "such a mistake is impossible with a practical microscopist." Moreover, lately I have had to examine some "deep-sea soundings" from the Arabian Sea, in which there were many minute foraminifera, and as it is at such depths that the foraminifera are most likely to be taken up alive or with the living sarcode of the animal in their tests, so most of these were covered with the so-called "cuticle" first seen on the substance of *Operculina Arabica*.

But are not the horizontal, or "spiral" laminæ (as they have been termed by D'Archiac and Haime in *Nummulites*), of *Operculina* composed almost entirely of vertical tubuli which establish a direct connection between the cavity of the chambers and the surface, and between the chambers of the overlying layers in *Nummulites*? Is not the sarcode which fills the cavities of the test of *Operculina*, &c., like

that of the Rhizopoda generally, viz. whose portions flow together when they come in contact; and would they thus not form a layer over the surface of the test? And, could the horizontal layers of the test be formed in any other way, or are they likely to be so, under such circumstances? Lastly, is not all this in favour of what I have stated, viz. that there is a substance, in appearance, like the "cuticle" of shells, over the dried specimens of foraminifera which contain the living organism when they are taken out of the water? But as I have already observed respecting the spicular structure of the cord, the fact does not rest upon argument but can be demonstrated, and upon demonstration I made the statement ten years ago!

The "vertical tubuli," as just stated, connect the chambers with the surface, not only in *Operculina*, but in the tests of *Nummulites*, *Orbitoides dispansa*, and *Orbitolites Mantelli*, and it is through their agency chiefly that the layers of shell and the chambers are vertically formed.

The openings on the horizontal surface over and about the septal spaces are those of canals connected with the great interseptal system. They are the same as MM. d'Archiac and Haime's "canaux d'une troisième grandeur," or middle-size-canals.

But besides these openings, there are spaces and lines in *Operculina* which are composed of shell-substance alone, that is, without the presence of the vertical tubuli, or the middle-size-canals, and these, in the test of recent *Operculina*, have the appearance of homogeneity and transparency, but are opaque and white in the fossilized one, where they evidently are identical with the opaque white portions of *Nummulites* which have afforded MM. d'Archiac and Haime some of their chief distinguishing characters; and thus, the latter are proved not to be what they supposed them, viz. remains of "larges canaux," but originally, transparent portions of the shell, unaccompanied by any canal, except accidentally, as will be more particularly shown hereafter,

Animal of Operculina.—Hardly anything more of the animal of *Operculina* is known now than when my description of the test was published; and I now as then, cannot help thinking that the existence of the animal matter of the *Robulina* which I examined at sea, and thought to be in the form of a worm in "loops" in the chambers, united by constrictions where the chambers joined close to the spicular cord, was a fallacy; for the observations were made at sea, in a little vessel, on the deck, in the open air, with simple, though powerful, lenses, and, since then all that I have been able to obtain from the specimens

of *Operculina* which had living animals in them when they were taken, is a number of membranous sacs, corresponding in form with that of the chambers, and united by a like membranous structure at the base, where the latter are in contact with the spire or spicular cord; together with the membranous portions of the interseptal canals; those of the marginal plexus; those which unite the chambers together through the interseptal spaces; and lastly, others which unite the chambers to the interseptal canals.

Besides this, the chambers have generally been more or less filled with minute, spherical, nucleated bodies, whose size I have mislaid, similar to those which I have described, and figured in the fresh-water Rhizopod, called "*Euglypha*," and which I have considered to be embryonal cells (Ann. vol. xviii. pl. v. fig. 26, and vol. xx. pl. 1, fig. 196, &c.), which again are like those figured by Dr. Carpenter in the cells of *Orbitolites* (Phil. Trans. pl. iv. fig. 3), and which he views as the sarcode broken up into propagative "gemmules." My own view of them in *Operculina* also, is, that they are propagative bodies of the species; but the most interesting point which their presence in the chambers of *Operculina* has elicited with me is that, by slight pressure they can be easily made to pass through the short channels of communication which exist between the chambers and the interseptal canals, into the latter, showing thus, as before stated, that one of the uses of the interseptal canals is to give exit to these bodies through the branches of the marginal plexus which open on the surface of the last or outermost turn of the spicular cord.

The bond of union between the chambers at the spicular cord is not tubular, or at least, I never saw the propagative spherules pass from one chamber to the other through it; while I am inclined to think that this bond is composed of part of the sarcodal plexus of the spicular cord, and that from *this* the chambers are developed, as will be better understood presently; also that the part of the plexus which is more directly concerned in uniting the chambers occupies the free surface of the spicular cord, and gives rise to that arched opening which exists between the septa and the spicular cord. The free margin of the septum here also frequently presents a scolloped form, as if it had rested on a plexus of sarcodal filaments, while in some cases I have not been able to distinguish any aperture between the septum and the cord at all, indicating that the two are sometimes in contact. All this seems to show that the chambers are developed from the marginal plexus and not from each other.

As regards the function of the chambers, the presence of the nucleated spherules above mentioned in them seems to indicate that they are the reproductive organs; and the fact that in *Alveolina elliptica* they are frequently almost wanting altogether, while in other instances they are interrupted two or three times by several turns of the cortical part alone (which part is analogous to the spicular cord of *Operculina*); and that, in the globose nummulites the chambers are frequently not distinguishable in the outer turns, shows that the development of the test can go on without the presence of the chambers, and therefore that they are probably supplementary and propagative. Indeed, the approximation of the turns of the spire or those of the spicular cord, which, of course, must entail a corresponding diminution in the size of the chambers, will be found by-and-by to indicate the full size of the species, in which the subsidence of the generative force appears to be thus indicated.

As yet, however, we know very little about the animal of the foraminifera, chiefly because we are so ignorant of the allied forms to it. The same is the case with the animal of *Spongilla*, which I have described (Ann. vol. xx. 1857). It fails to elicit much attention, because at present it has no known alliances, but by-and-by, when these are found out, and more forms of the same kind are discovered for comparison, then the nature and position in organic development of these beings will be realised, and their component parts understood. Till then they must remain in abeyance.

Mode of growth.—The mode of growth in *Operculina* and *Nummulites* is the same. That is, the horizontal portions, or spiral laminæ as they have been termed by M.M. d'Archiac and Haime, are developed from the sarcode of the chambers passing through the vertical tubuli; while the spicular cord and the chambers in the first instance spring from the marginal plexus of sarcodal filaments. The latter is shown in *Alveolina* as above stated, where the chambers cease to be developed and then appear again after several turns of the spire have been completed by the cortical layer alone, which part, as before stated, is analogous to the spicular cord. Both the segments of *Operculina* and those of *Nummulites* begin to be formed from the spicular cord, and three or more of the last are generally in successive stages of development, the last of all being the least formed. This must not, however, be confounded with the last chambers of the fully developed *Operculina*, which, like those of *Nummulites*, are also successively less in size.

More recent observations.—Since the above was written I have again

determined, for examination, to sacrifice two or three more of the few specimens I still possess, of *Operculina Arabica* containing the living animal when they were brought up with the "sounding-lead" on the south-east coast of Arabia in 1844, now of course dry; and for this purpose one of these was placed in very weak spirit-and-water for a night first, another examined at the moment of being broken-up in water, and a third subjected to a very weak solution of nitric acid and water for a night, with the following results. It was found that in the latter experiment, the chambers and the canals, after having been gradually deprived of their calcareous matter, still retained their form in a membranous state, and under this condition they will now be described.

Chamber.—The horizontal or exposed walls of the chamber in a membranous state present a number of semi-opaque circular bodies arranged in a pavement-like form close together, each of which has a depression or hole in the centre, and these correspond to the "vertical tubuli;" while the septal borders are composed of a transparent membrane without these bodies, but pierced here and there with large holes from which tubes are extended to the interseptal canals. The marginal border of the chamber is also supplied by a transparent membrane loosely attached to the spicular cord, but the base or internal margin is firmly fixed to the marginal plexus of canals; now of course in the way we are examining them all rendered membranous by the absence of the calcareous matter.

The chamber thus reduced to a membranous state is found to contain in its cavity various bodies, viz. small and large spherules, and starch-grains, to which we will now severally direct our attention.

Small Spherule.—This consists of a spherical portion of semi-opaque, homogeneous matter, surrounded by a delicate, spherical, transparent cell 1-5400th of an inch in diameter. The chamber may contain a few only, or be crammed with these bodies, and they are observed to be massively attached to branched stems or filaments like bunches of grapes.

Large Spherule.—The large spherule consists of a spherical portion of homogeneous matter charged with granules and enclosed in a spherical, transparent capsule about 1-1800th of an inch in diameter. The capsule is not always visible if present, and the form frequently slightly elliptical, while the colour is sometimes yellowish by transmitted light like that of dried albumen, and at others white by reflected light, as if there were calcareous matter in it; perhaps the former difference may be from drying or pressure, while the latter is evidently that of advancement in development.

Starch-grains.—These are thin, flat, and variable in size, but otherwise bear the unmistakable characters of the “starch-grain.” They were not numerous but always present, and, with many portions of the other soft substance of the cavity of the chamber, became purple and blue respectively, under the influence of the deliquescent, yellowish liquor of iodide of potassium assisted by a little sulphuric acid.

Canal-system.—The canals having been deprived of their calcareous matter became equally membranous with the chamber, and those portions forming a communication between the chamber and the “interseptal canals” freely admitted the largest spherules to pass through them from the former to the latter; besides this, I find a number of them in one of my dried specimens without the animal, in all parts of the canal-system.

From these facts we learn that there are two kinds of spherules produced in the chambers, the larger of which appear to be but an advanced state of the smaller, but whether this be the correct view, or that the smaller ones be the sperm-cells or some other organ belonging to the chamber, remains to be shown. That the large spherules cannot be viewed in any other light than as propagative bodies, there can be no doubt now; but whether again, these be impregnated or unimpregnated reproductive agents also remains to be shown. That they are the same which I have already pointed out as the reproductive agents in both the *Euglyphæ* and in *Amœba verrucosa* (*loc. cit.*) appears also to me to be undoubted.

The next fact is, that the passage of these bodies freely from the chamber into the interseptal canals proves that, one use at least of the canals is, as before stated, to give exit to the contents of the chambers.

Lastly, the presence of starch-grains, although not wonderful as the organism is distinctly a Rhizopod and starch-grains abound in *Spongilla*, especially in the capsules, is nevertheless interesting, as their presence also in the winter-eggs of the freshwater Polyzoa and the close resemblance of this “egg” to the capsule of *Spongilla*, thus makes the presence of starch-grains in all, one point at least, which so far, allies these organisms. Not only this, but the resemblance of the canal-system, or rather the sarcodal filaments which it contains, to the mycelium of Fungi as before noticed, and the evident connexion that also exists between *Spongilla* and some of the parasitic developments of the cell-contents of the Algæ (now properly regarded by Pringsheim as allied to *Achlya* and *Saprolegnia*), whose spores first consisting of monociliated polymorphic cells then lose their cilium and become

simple rhizopods, while other developments of this kind are distinct Fungi putting forth sporangia with defined sporules,—seems to point out the passage of the animal into the fungal kingdom through the Foraminifera and Sponges. The parasite to which I more particularly allude is that termed by Pringsheim, *Pythium entophytum*, which grows out from the cell-contents of *Spirogyra*, and in its sporangia produces the monociliated spores mentioned, which, in 1857, I described as furnishing an instance of the “transformation of the vegetable protoplasm into *Actinophrys*,”* forsaking my original argument that these products *must* be parasitical, which Pringsheim’s discoveries have now confirmed.†

Besides the course which the spherules have for their exit through the canal-system, some of my recent specimens present a hole here and there at the base of the few last chambers, opposite the great spiral canal, in which holes the large spherules, now white, may be seen, as if in the act of being voided, and probably from the great spiral canal. A single large hole with smooth margin evidently formed by the animal itself also appears here and there sometimes, in the side of the chambers, and this may have been for the purpose of giving exit to young *Operculinæ*, which had become too large to obtain their issue in the ordinary way, such as those noticed by Professor Schultze in the *Rotalidæ* (“Annals,” vol. vii, p. 306.—1861), and Dr. S. Wright (*id.* p. 357, vol. vii.). But both these kinds of holes must be regarded as accidental, and not as regular developments of the test.

NUMMULITES.

The structure of the test of *Nummulites* is precisely that of *Operculina*, plus the lateral or vertical growth of the former, which is but a repetition, in plan, of the horizontal plane. Of this I was aware in 1852, when my description of the structure of *Operculina* was published, and my diagram of an infiltrated specimen of *N. Acuta* (Ann. l. c.), to confirm this, accompanied it. Since then, as before stated, the “canal-system” has been figured by Ehrenberg from an infiltrated specimen of *N. striata*; and within the last twelve months I have been able to see everything which I have described in the test of *Operculina* exemplified in richly infiltrated specimens of another of the “Striatæ,” viz. *N. Ramondi*, accompanied by equally richly infiltrated specimens of *Operculina*, so that the means of identification has through the latter been most satisfactory.

* “Annals,” vol. xix, pl. 259.

† Ann. des Sc. Nat. t. xi, pl. 349, pl. 7, Bot.—1850.

Canal-system.—The lateral or vertical development of *Nummulites* being the only additional part to the horizontal plane as it exists in *Operculina*, I have merely to state of the canal-system of this, that radiating branches are continued upward towards the centre or umbilicus of the nummulite from the great "spiral" canals of the cord, or from others near this, along each interseptal space, and from each turn of the cord; that vertical branches also from each turn of the cord opposite the interseptal spaces respectively keep up a communication by joining the radiating branches of the different layers of the spiral lamina, between the marginal plexures of the turns of the cord respectively and the surfaces; and that, in some nummulites, where there is a corresponding division in the portions of the chambers extending up towards the centre, with the turns of the spire, the radiating branches are connected by transverse ones; so that, in fact, each chamber is surrounded by an anastomosing circle of canals thus formed. While, in the reticulated nummulites, this anastomosis becomes retiform from the reticulated division of that part of the chambers which enters into the composition of the spiral lamina. Lastly, this canal-system sends off branches which open on the surface in the course of the interseptal spaces and along the spiral canals as in *Operculina*. Thus in each lamina of the nummulite the canal-system of the horizontal plane is repeated.

Vertical tubuli.—These enter into the formation of each spiral lamina just as they do into the single one of *Operculina*.

Non-tubular spaces.—Such are parts of the test which are not traversed by either the vertical tubes or the branches of the canal-system, and, as before stated, in recent *Operculina* are marked by a homogeneous, semi-transparency of the shell-substance, while in the fossilized species they are opaque and white; a transition which leads to the knowledge of what they are and were in *Nummulites*. They may be linear, as when forming that part of the test over the interseptal spaces, or punctiform as when in the midst of the vertical tubuli, and in both positions afford signs, according to their form and number, for specific distinction. In *N. Biaritzensis* these white parts may be seen to form also a minute branch-work, which extends perpendicularly outwards from the septal lines; and in *N. perforata*, a similar branch-work may be observed to spread from both the septal lines and the puncta (very like the lacunæ and their branch-work in bone), but to such an extent in some specimens as to present a minute reticulation all over the cameral spaces, so much resembling a capillary canal-structure that, at first sight, there seems to be no doubt of it. However,

their being formed of an opaque white substance like the septal lines and the puncta, first leads to the opinion that they are not tubes; and this is confirmed by microscopical examination of portions of the spiral lamina of *N. perforata* presenting this structure, when ground down to a thinness sufficient to allow the light to pass through them; for besides the absence of any double line indicative of the presence of a tube in these white lines which then are found to be made up of little disjointed portions of opaque material, a lash of branches from the "canal-system" may here and there be observed to come through one of the puncta, and spread out among these white lines, when the double line and transparency indicative of a continued canal in them, at once and by contrast, shows the nature of both. Thus from what has been stated we see that, neither the white puncta nor the minute white branch-work of lines were ever tubular. In most nummulites the white puncta appear on the surface, and, when examined by a vertical section of the nummulite, are observed to be more or less conical, and of different lengths, according with the date of the commencement of their development; those which began with the earliest parts of the nummulite being longest. They arise in points from the surface of the chambers and the inter-septal spaces, and end at the periphery, on a level with the rest of the test, but, being harder than the latter, they project on weathering, become rounded, and thus give the fossil a more or less granular surface. Now, in none of these white lines, white puncta, nor minute white branch-work, have I ever been able to see any indication, either in the recent *Operculina*, the fossilized infiltrated one, or in *Nummulites*, any branches of the canal-system, except by accident. Neither in the ends of the columns in *Orbitoides dispansa*, which are the same as those of nummulites, have I, in the most richly and minutely infiltrated specimens, been able to see in the ends of the white columns on the surface any red or yellow point indicating that they are always in connexion with a branch of the canal-system which traverses them longitudinally. So we must set these portions down as having nothing to do with the canal-system, however much they may conduce to the strength of the test.

Thus we see that the "très-petits canaux" of MM. d'Archiac and Haime (p. 60) were the "vertical tubuli;" their "canaux moyens," the openings of the canal-system on the surface and along the spiral canals and spicular cord; and their "larges canaux," no canals at all, but the ends of the columns of condensed shell-substance. Dr. Carpenter, who also at first considered the latter canals, renounced this view long ago, (Phil. Trans. 1856, p. 553, *foot-note*).

Spicular cord.—The same infiltrated specimens of *N. Ramondi* which were obtained from the Rajpipla Hills, a little south of the river Nurbudda, near Broach, that have latterly furnished me with such beautiful confirmations of *Nummulites* possessing the same canal-structure as that in *Operculina*, have afforded almost as much evidence of the spicular composition of the cord; for besides being accompanied with equally beautiful infiltrated specimens of *Operculina* for comparison, they are all imbedded in a yellow, argillaceous limestone, in such a way, that, by careful fracture, they fall out with surfaces so polished and even, that their preservation thus far, may be said to be complete, and hence the marking on the surfaces respectively is most evident. We, therefore, have only to put the margins of *N. Ramondi* and this *Operculina* together, and bring them into the focus of a microscopic power to see that, those on the cord of the *Operculina* are a fac-simile of those on the cord of recent *Operculina Arabica*, which we know to indicate a spicular composition, and that those on the cord of *N. Ramondi* are precisely like those of the fossilized *Operculina*, with the exception that, the lines are less interrupted in the cord of the nummulite, and are, therefore, continuously, much longer, which indicates much longer spicules; but the fact of all the spicules not being of the same form or of the same length in the same species, or of different lengths generally, in another most closely allied organism, to wit *Nummulites*, does not affect the verity of the spicular composition of the cord. Indeed, writing of these lines as supposed grooves, MM. d'Archiac and Haime state, p. 63 :—"Les sillons, dont le nombre et le degré de rapprochement varient un peu, sont sensiblement droits et continus dans la plupart des cas, mais quelquefois (*N. lævigata*, pl. iv.) ils sont très légèrement flexueux, et assez fréquemment interrompus." The latter is the case with the lines on the cord of *N. Ramondi*, and the same interruptions or terminations, in a *pointed* form, I have observed in *N. spira*.

Further, on comparing the cords of the two fossils mentioned, viz. *Operculina* and *N. Ramondi*, we observe a number of red points in the lines or intervals between the spicules, which are nothing more than red oxide of iron filling the canals of the marginal plexus in both the *Operculina* and *Nummulite*, which open on the surface of the cord. Thus the identity in structure and composition of the surface of the spicular cord in *Operculina* and *Nummulites* is so far complete. But we have still the interior to identify, which, as far as the layers (planes of spicules in *Operculina*) radiating from the inner side of the cord to its circumference go, even to their being constricted at intervals into a

number of short portions, and the planes of the canal-system between them,—I have been able to see in the *N. spira*, *N. sublaevigata*, and *N. Ramondi*, both in the transverse and horizontal section of their cords respectively,—still not the remotest trace of the circular or the horizontal lines of the spicules in either one or the other of these sections have I seen. When, however, it is remembered that although I have preparations to show distinctly the linear contours of the spicules in the horizontal section of the cord of *Operculina Arabica*, and therefore, can infer the existence of the circular lines which they must present in the transverse section with certainty, though I have not yet succeeded in making a preparation to show them so satisfactorily in the transverse section; (nor can they be demonstrated either in the horizontal or transverse section in fossil *Operculina* under the most favourable circumstances although they no doubt did exist there, a bit more than in *Nummulites*); it is not to be wondered that, they should not be demonstrable in *Nummulites*, where crystallization and fossilization must have more or less blended these structures into one mass. But with the surface-identity mentioned, the presence of the planes of opaque matter in the transverse section of the cord (which represent the planes of spicules in *Operculina Arabica*); divided partially at short intervals by transverse constrictions (which in *Operculina* define the ends of the spicules); and the transparent planes or intervals in which are seen the truncated ends of the great horizontal canals of the canal-system in recent *Operculina*;—I think we have here quite sufficient to enable us to infer that the cord in *Nummulites* was generally of the same composition as that of *Operculina Arabica*, but with the spicules much longer; that is to say, that the cord was composed of the same kind of materials, viz.: 1st, the crystalline matter of the spicules; 2nd, the interspicular substance; and 3rd, the canal-system. To arrive at this conclusion however, it is necessary to be first well acquainted with the spicular cord in recent *Operculina*; then to compare this with fossil *Operculina*; and lastly, to compare the latter with *Nummulites*: all of which must be in specimens favourable for the purpose; since a mere section of the cord of *Nummulites* would inevitably be met with a denial of its spicular composition, so little appearance is there in it of spicules.

Moreover, the "great spiral canals" of the cord of *Operculina Arabica*, to which I have alluded at the commencement, and which are evident also in the cord of *N. Ramondi*, (though not so evident, if existing at all, in *N. sublaevigata*,) did not escape the penetrating and sagacious observation of the authors of the "Fossiles de l'Inde,"

for they, as I have previously shown, not only figure the openings of the marginal plexus, but the two great spiral vessels also of the cord in *N. planulata*, and describe them in the words which have been already quoted.

Yet, in their "Work," MM. d'Archiac and Haime have stated (p. 54), "Nous nous sommes assurés, par des observations très multipliées, que dans aucune des espèces de ce dernier genre [*Nummulites*] il n'existe rien qui puisse rappeler la corde spiculaire ni le plexus marginal signalés par M. Carter dans l'*Operculina* d'Arabie." Had the lamented naturalist whose name is last mentioned been alive, he, with his noble colleague, would now have admitted that what I stated, and showed in a figure, ten years since, at least as regards the existence of the marginal plexus in *Nummulites*, was correct. It has been admitted by Dr. Carpenter (Phil. Trans. 1859, p. 26), although he also still denies the spicular structure of the cord, but will not do so any longer I think, after seeing my preparations. Dr. Carpenter has, however, long since marked out the skeleton of the spicular composition of the cord, as will be seen by the grooved lines on the surface, and the radiating ones in the transverse section, represented respectively in his figures of *N. lævigata* (figs. 17 and 15, pls. iv. & v. Qt. Journ. Geol. Soc., vol. vi.—1850). At the same time it should be remembered that the longitudinal grooves do not always indicate spicules, but circumscribe spaces which can be seen under a much lower power than the spicules.

Propagative spherules.—So recent must have been the infiltrated specimens of *N. Ramondi* when they were imbedded, that even the spherules assumed to be propagative gemmules or embryonal cells in *Operculina Arabica*, are exquisitely preserved in a fossilized state in many of the chambers of the former, where they are all spherical in shape, but vary in size, below the 1-2800th of an inch in diameter. They are not only found to exist in every part of the chamber up to the umbilicus of the nummulite, but in the primary chamber itself, and may be not only seen in every part of the canal-system, but (the smaller ones) also in the vertical tubes of the spiral lamina, on their way out. In the infiltrated specimens of *Orbitoides dispansa* they also abound, throughout both the chambers of the central plane and the columnar chambers, even to the centre of the fossil. I have also seen them in the chambers of *Orbitolites Mantelli*, *Orbitolina lenticularis*, and in *Alveolina elliptica*; and thus occurring so generally, there can be no longer any reasonable doubt that they are what I have assumed them to be, viz. "propagative agents," but whether the product of impregnation

or of simple generation, remains for further research to determine. In one section of *N. Ramondi* which I possess (for I have sections by me to prove everything that I have stated,) there is a spherule in one of the chambers of the last turn which has thrown out a second one, with a nautiloid form of test around it, indicative of *Nummulites*, being occasionally viviparous, as before stated to have been noticed in the *Rotalidæ* by Prof. M. Schultze ("Annals," l. c. p. 320).

Mode of growth.—This, like that of *Operculina*, is simply spiral with the chambers continued up to the centre or umbilicus of the *Nummulite*. The development of the chamber commences from the spicular cord and extends outwards and inwards from this point; but it is not fully formed for some time afterwards, so that there are several always present in successive stages of completion, from the chamber just budding to that one extending from the margin to the umbilicus. This gradation is also a consequence of age or full development of the nummulite, there being a gradual diminution in size from the largest chamber to the primary one on one side, as there is from the largest to the last formed one on the other; hence the circular form of nummulites. The same has been stated of *Operculina*, but here the termination is generally more abrupt, which causes the test to assume a somewhat elliptical form.

Classification of Nummulites.—On this subject I have but few observations to offer, after the able one proposed by MM. d'Archiac and Haime, (p. 72,) viz. 1st, *Læves aut Sublæves*, 2nd, *Reticulatæ*, 3rd, *Subreticulatæ*, 4th, *Punctulatæ*, 5th, *Plicatæ vel Striatæ*, and 6th, *Explanatæ*. What I have to state however, will be chiefly found under the descriptions of the species which have elicited it respectively.

The dividing of the nummulites which present a reticulated structure on the surface from the rest, which I proposed (Ann. p. 164, 1853), was being formed by MM. d'Archiac and Haime for their 2nd and 3rd groups at the time I was writing my MS. in India. So it is evident that I was not single in suggesting this, although I made a mistake, as they notice (p. 343), in attributing the suggestion to Dr. Carpenter in the first instance, whose proposition on the other hand (Qt. Jl. Geol. Soc. l. c. p. 30) was, to make the *Assilina* a "sub-genus" of *Nummulites*. Both as regards MM. d'Archiac and Haime's dividing the reticulated *Nummulites* into two groups, and the changing of the name *Assilina* to *Nummulites* respectively, I think it would have been better to have made but one group of the former, as noticed by Messrs. Parker and Jones (Ann.), and not to have changed the name of the latter, for reasons which will be hereafter mentioned.

Again, as regards my observation that the reticulated Nummulites viz. (*N. acuta*, Sow.) "borders close upon Orbitoides," MM. d'Archiac and Haime observe (p. 343), "Il n'y a pas plus de passage entre cette Nummulite et l'organisation des Orbitoides (*O. dispansa*) qu'entre tout autre corps de ces deux genres." I was wrong certainly in stating that there was a commencing degradation of the spire in *N. acuta* into the horizontal plane of *Orbitoides*, but no further, for, as will be seen, the external appearance as well as the internal structure of *O. dispansa* approximates it to the reticulated nummulites more than to any other discoid nummulite. Thus, the thinness of the margin, abrupt elevation of the centre, and reticulated structure of the lateral masses are especially characteristic of both, although the abrupt elevation may not always be present in either. The columnar structure, viz. the "larges canaux" of d'Arch. et Haime, is particularly developed in the reticulated nummulites, and is analogous to that of *O. dispansa*, although not so much developed. But, as will be seen by and by in *Orbitoides*, the rows of chambers in the horizontal plane are cyclical, which is a character of *Orbitolites* and not of *Nummulites*. This, then, makes *O. dispansa*, although it more than all the other large discoidal foraminifera approaches the reticulated nummulites, distinctly differ from them. It will be observed further on, that the structure of *Orbitoides dispansa* compels us to view it as merely a *Cycloclypeus* with lateral growth, and Dr. Carpenter, who has studied the latter, observes (Phil. Trans. 1856, p. 563), that, while *Cycloclypeus* agrees in most points with *Nummulites*, it only differs from it essentially "in the single circumstance that the mode of increase is cyclical instead of helical." So that we have here still further, though indirect, confirmation of what I have before stated, viz. that *N. acuta* "borders close upon *Orbitoides*." As to the defective state of my figures (Ann. vol. xi. pl. vii. 1853) misleading the authors of the "Fossiles de l'Inde," it should be remembered that they bear on their faces that they were only meant as diagrams, and that, in India we have not only frequently to find the objects themselves, but to make sections of and draw them, before we describe them, and some times to lithograph them; and therefore, that it would be fairest to judge from the descriptions, as they are most likely to be correct, seeing that we have neither such means nor such men to make sections, drawings, &c. for us in India as can be obtained in Europe.

ALVEOLINA, d'Orb.

Of this genus I have nothing to state here further than that, the tubular, cortical structure appears to me to be analogous to the

spicular cord and its canal-system in *Nummulites*, and the chambers, to both the horizontal plane and those parts of the chambers which are lengthened out towards the poles or lateral eminences in *Nummulites*. As before stated, *Alveolina* looks to me like a flat nummulite drawn out in each direction laterally, and has its transitional form in the globose nummulites. Never having had a highly infiltrated specimen, I cannot state what the minute structure of its canal-system is, nor whether the cortical layer, which corresponds to the spicular cord of nummulites, contained any spicules; but I should think not, and that the canal-system was replaced by the tubular structure of the cortical layer. As before stated, spherules have been observed in *A. elliptica* in its innermost chambers.

The species of *Alveolina*, viz. *A. Boscii*, described and illustrated by Dr. Carpenter (Phil. Trans. 1856, p. 552), is totally different from Parkinson and Sowerby's *Fasciolites elliptica*, which is the type of the *Alveolina* of Sind; and of which I have given illustrations (Ann. 1854, v. xiv. p. 99). While the new species, which I have described further on under the name of *A. meandrina*, is again so different from either and from any other existing description, that at first sight it seems doubtful whether it should not form the type of a new genus. On examining it internally, however, it is found that its chambers, although tortuous like those on the surface of *N. Gyzehensis*, &c., commence in a spiral form as simply as those of *Operculina*, but instead of remaining sub-sigmoid as in *A. elliptica*, become tortuous; while there is a reticulated canal-structure arching over each and supported on vertical tubes connected with a similar structure over the preceding layer, which, when viewed longitudinally in a vertical or horizontal section, appears to correspond to the tubular structure arching over the chambers and interseptal canals respectively, of *A. elliptica*, which structure again corresponds, as before stated, to the spicular cord and interseptal canals of *Operculina* and *Nummulites*.

ORBITOIDES, d'Orb.

In this family two distinct genera have been included, viz. *Orbitoides dispansa* and *Orbitoides Mantelli*, d'Orb. (*Orbitolites Mantelli*, Cart.), as will be seen by their descriptions hereafter under their respective heads. Moreover, it will also be seen there that they are so different that they can hardly be included even in the same family; at least, while the former is closely allied to *Cycloclypeus*, Carp., the latter is so closely allied to *Orbitolites* that I proposed the name of "*Orbitolites Mantelli*" for it, instead of "*Orbitoides*" (Ann. vol. xi. p. 174,—1853).

Whether this was a better name than its original one, that is than "*Orbitoides Mantelli*," I will not stop to discuss now, but go on to notice the structure of these two fossils respectively and summarily, referring the reader to a more detailed description of them under their proper heads. The detail of their anatomy has been obtained from richly infiltrated specimens in which, as in the nummulite and *Operculina* mentioned, the red or yellow oxide of iron so completely fills up the cavities of the test which were originally occupied by sarcode, while the rest remains more or less transparent and white, that sections of the fossil in this state give a much better view of these cavities than could be obtained from the test, were it present in its unfossilized condition and occupied by the living animal are.—Following are the summary descriptions of them respectively:—

Orbitoides dispansa.—The test of this discoidal fossil consists of a horizontal plane of *oblong* chambers covered in on each side by a mass of columnar ones. The chambers of the horizontal plane are in circular rows, concentrically arranged around a central, globular cell which may be large or small. (Formerly I stated that they began "multi-spirally" and gave a figure "Ann." v. ii. pl. vii. 26, to prove it, but I have since found, that this was drawn from a section of a minute *Heterostegina* which I had mistaken for an *Orbitoides*.) Each chamber is connected with the two immediately behind and before it respectively by stolon-processes, and the chambers generally, increase in length in the radial direction of the test, with their distance from the centre, up to a certain point, when their vertical diameter preponderates over their horizontal one, not from increase of the former, but from diminution of the latter, following, therefore, the same law that is observed in *Nummulites*. The columnar chambers, on the other hand, are arranged in convex layers arching over the horizontal plane; each chamber is compressed vertically; varies in shape and size; and is united to those immediately around it by stolon-processes. Interspersed between the columnar chambers are a number of columns of a conical shape, having their pointed ends on the horizontal plane and their large extremities on the surface; these consist of non-tubular condensed shell-substance, which is opaque and white in the fossil, and are analogous to the white columns in *Nummulites* and similar structures in recent *Operculina*. Vertical tubuli exist throughout the horizontal layers of shell-substance as in *Nummulites*; and there is a double horizontal canal-system consisting of a single layer of net-work tubulation on each side of the horizontal plane, whose meshes are parallelograms, and enclose respectively one of the oblong chambers.—One cannot help seeing

here a part at least, of the canal-system of *Cycloclypeus* (Phil. Trans. 1856, pl. xxix. fig. 11). Whether it be from the smallness of my specimens, which, however, are $\frac{4-8}{12}$ inch in diameter, or the smallness of the canal-system, but I think the former, from the remnants of this system being most evident in the largest ones, no other part of the canal-system which has been described by Dr. Carpenter in *Cycloclypeus* appears to be developed in them.

Orbitolites Mantelli, Cart.—This discoidal fossil consists of a horizontal plane of *globular* chambers, which become cylindrical externally and are covered in on each side by a mass of columnar ones. Those of the horizontal plane are in circular rows, concentrically arranged around a central one and are *not* connected by stolon-process, but *attached* to sarcodal canals as will be mentioned directly; they also increase only slightly in their horizontal diameter with their distance from the centre, while they so increase vertically as to become cylindrical, and thus cause the horizontal plane to be much *thicker* at the circumference than in the centre. The columnar chamber-structure is exactly the same as in *Orbitoides*, but there are *no* columns of condensed white shell-substance. Vertical tubuli exist throughout the horizontal layers of shell-substance as in *Nummulites*. The canal system is composed of two sets of sarcodal channels which permeate the test:—the first consists of *radiating* horizontal ones which spread off spirally, like the lines on an engine-turned watch-case, from the centre to the circumference; these are arranged in layers, commencing with two (?) in the centre which are separate from each other, but whose lines, crossing in their course to the circumference, after the manner mentioned, unite *separately* with the chamber which is fixed in the internal angle of the interspaces that they thus form; afterwards they become doubled, and trebled, as the chamber lengthens, so that at the circumference each chamber becomes connected with six of such canals, and six openings appear between the chambers, at the margin of the test, in zig-zag, one above another. The second set consists of *annular* horizontal canals, arranged concentrically in two layers only, viz. one on each side the horizontal chamber layer, on a level with the ends, and between the rows of chambers respectively, with which they are united on the inner side; also a sub-system consisting of much smaller canals, one set of which connects the annular bands horizontally between the chambers; another connects them vertically, through the horizontal plane; and the third only seen occasionally, seems to ascend vertically from the annular canals of each side to be lost in the interspaces between the columnar chambers.—Here also one cannot help seeing the

sarcodal system of *Orbitolites* given in Dr. Carpenter's diagram, (Phil. Trans. 1856, pl. v. fig. 6) ; but I do not see that scalloped form of the annular bands in the infiltrated specimens which appears in the uninfiltrated ones, and is represented by Dr. Carpenter as bearing the chambers in *Orbitolites*, nor do I see the stolon-process coming from the *convexities* of the scollops to form the chambers of the next row outwards, unless the faint transverse radiating lines of the "sub-system" be these. Further, Dr. Carpenter (p. 222) only allows a single layer of annular bands in the simple type of *Orbitolites*, and assuming that the horizontal plane of *Orbitolites Mantelli* commences in the same way, we might assume that it also possesses only a single layer ; but the minuteness of the structure in the central part almost defies this decision in my specimens.

The reader will now have seen the differences between *Orbitoides disparisa* and *Orbitolites Mantelli*, and their correspondences respectively with *Cycloclypeus* and *Orbitolites*. He will also have seen how, partly following d'Orbigny's description of the latter genus, I fell into the error of changing the name of "*Orbitoides Mantelli*" into *Orbitolites Mantelli*, now evidently an ill-chosen one, although it should not be called "*Orbitoides*," whose position I shall more particularly assign presently.

It is also questioned by MM. d'Archiac and Haime, if this *Orbitolites Mantelli* be the *Orbitoides Mantelli* d'Orb. of the United States ? (Tab. p. 363.) Yes. It corresponds with the figures given by Dr. Carpenter (Qt. Jl. Geol. Soc. l. c.) of this fossil, which are too faithful to be mistaken.

CONULITES, *nov. gen.*

This beautiful little discoidal fossil, which appears to me to have hitherto been undescribed, and upon which the genus is therefore founded, was discovered among a number of nummulitic fossils from the valley of Kelat, which were sent to me by Dr. Cook, after whom I have named the species, in commemoration of his indefatigable and successful exertions on behalf of Geology in that locality. It is not, however, confined to the valley of Kelat, for I had specimens imbedded with nummulites by me from Sind, one of which being a vertical section in a polished pebble of nummulitic limestone, always puzzled me, before I recognised the fossil in its free state, while, being partially infiltrated with yellow oxide of iron, it has since enabled me, more than any others, to describe the internal structure. This, together with the external form of the fossil, will be found fully detailed further on, under its proper head, and therefore all we need here is a short generic summary of its description, which is as follows :—

Gen.—Conical, compressed, discoidal: consisting externally of a spiral layer of rhomboidal chambers, extending from the apex to the circumference; filled up internally with convex layers of compressed columnar chambers interspersed with white columns of condensed shell-substance; white columns opaque, conical, their sharp ends resting on the inner aspect of the spiral layer, and their large ones terminating at the base of the cone, which presents a slightly convex, granular surface.

It will thus be seen that, while *Conulites* in its conical form, external layer of chambers, and internal columnar chamber structure, is analogous to *Orbitolina* generally, but more especially to the solid conical forms; it—in possessing the white columns of condensed shell-substance—is also allied to *Orbitoides*; while it differs from the latter and agrees with *Nummulites* in the spiral arrangement of the layer of chambers externally. Hence it becomes questionable after all, whether the cyclical and helical characters are of much use in classification, but to this point we will return again after having alluded to the other genera of Foraminifera, in which I shall have to describe species.

ORBITOLINA, d'Orb.

Of this genus I have nothing to add more than is stated under the species which I have described.

CYCLOLINA, d'Orb.

This now appears to me to be a species of *Orbitolina*, which, had it been better defined by d'Orbigny, would have saved me from much error, as will be observed by my "Observations" under the head of "*Orbitolites pedunculata*" at the end.

HETEROSTEGINA, d'Orb., and CYCLOCYPEUS, Carp.

Under these names respectively will be found a description of the specimens of *Heterostegina* and *Cyclocypeus* which with *Orbitolites Mantelli*, I found together on the south-east coast of Arabia.

Of the former I have nothing to add here; but as regards *Cyclocypeus*, from existing specimens of which Dr. Carpenter has given his excellent description and illustration of the genus (Phil. Trans. 1856, p. 555, &c.), one cannot help seeing, in the oblong form of the chambers, the irregularity of the rows, their cyclical arrangement, their vertical thickness diminishing towards the circumference, each chamber being connected with two behind and two before it, the canal-system, and lastly, the conical non-tubular parts of the test, which resemble the

columns, that *Cycloclypeus* approaches *Orbitoides dispansa* as nearly as *Operculina* approaches *Nummulites*.

In my description of the minute structure of *Orbitoides dispansa*, I have not, as before stated, been able to see such an elaborate disposition of the canal-system, but then the size of the recent specimens of *Cycloclypeus* examined by Dr. Carpenter, and their structure generally, far exceeding in both, the infiltrated specimens of *Orbitoides* in my possession, may partly, if not wholly, account for this.

For further observations on the specimens of *Heterostegina* and *Cycloclypeus*, which have come under my notice, see their descriptions respectively.

ORBICULINA and ORBITOLITES.

The exhaustive and valuable researches of Dr. Carpenter on these two genera, given in the "Philosophical Transactions" for 1856, preclude the necessity of my making any further observations on them beyond what will be found under the species which I have had to describe.

Classification.

I would here merely observe that, as regards family distinction, it appears to me that *Orbitoides dispansa* and its type, *Conulites*, *Heterostegina* and *Cycloclypeus* should come together under one head; and *Orbitolites Mantelli*, Cart., *Orbitolina*, *Orbiculina*, and *Orbitolites*, as defined by Dr. Carpenter, under another. Perhaps it will be stated that the spiral form of the layer of chambers in *Conulites* should place it with *Nummulites*, among d'Orbigny's "Hélicostègues," irrespective of its being in every other way most closely allied to *Orbitoides* which belongs to the "Cyclostègues;" and hence the doubtful value of the helical and cyclical characters as natural distinctions, to which I have before alluded.

Conclusion.

Having thus made all the prefatory observations that I have to offer at present, on the different genera of Foraminifera, whose species I shall now have more or less to describe particularly, let us proceed to this part of the subject, remembering, as before stated, that my object now is solely to correct, add to, and explain what I have hitherto stated, and that, therefore, much will be found in my "Paper" in the *Annals* of 1853, to which I have alluded, which is omitted here. It will be also necessary for the most part too, that the reader should provide himself with copies of MM. d'Archiac and Haime's "Monograph on the Nummulites," and Dr. Carpenter's Researches in the "Philosophical Transactions" respectively, for they are so indispensably necessary to

the study of the Foraminifera, that it is impossible to get on without frequent reference to them.

Among the new forms that I have had to introduce, will be found two varieties, viz. *a* and *b* of *Assilina seu Nummulites exponens*, and one new species, viz. *A. obesa* belonging to the "Explanatæ." One new species belonging to the "Punctulatæ," viz. *N. Broachensis*. Two species to the "Plicatæ vel Striatæ," viz. *N. Makullaensis*, and *N. Kelatensis*. One species to the "Reticulatæ," viz. *N. Masiraensis*, and an undetermined one from the coast opposite. One new species of *Alveolina*, viz. *A. meandrina*. And a new genus and species, viz. *Conulites* and *C. Cooki* respectively. One variety, if not a new species of *Orbitoides*, viz. *O. asterifera*, and perhaps some new forms of *Orbitolina*.

Further Observations on the Larger Fossilized Forms of Foraminifera in Sind, &c.

OPERCULINA, d'Orbigny.

"2. *O* ———?"—See my first "Paper," on the larger forms of Foraminifera in Sind, &c. (Ann. Mag. Nat. Hist. v. xi. p. 167.—1853).* This *Operculina* which I did not like to name, as I did not know whether or not it was a new species, has been called by MM. d'Arch. et Haime, (p. 347,) "*O. Tattaensis*," after the place where it was found.

Obs.—*Operculina* is much more nearly allied to *Assilina* than *Assilina* to *Nummulites*. *N. spira*, which is an *Assilina*, is but a gigantic *Operculina* with enlarged spicular cord.

ASSILINA, d'Orb.

"1. *A. irregularis*, H.J.C." (Ann. p. 168).—This has been rightly identified by d'Arch. et Haime (p. 343) with *N. spira*, de Roissy. Nevertheless it is an *Assilina* according to d'Orbigny's definition, and so closely allied to *Operculina*, that the spicular cord and the septa of the chambers, that is, the spire altogether, is, with the exception of the central part, as visible as in *Operculina*.

Largest size.†—Breadth, $\frac{17\frac{1}{2}}{12}$ inch (36 $\frac{1}{2}$ millim.)

* After this "Ann." and "p." will only be mentioned, the other part of the reference being understood to be the same, unless otherwise noticed.

† "Largest size" means the largest in my possession. "Breadth" means the longest horizontal diameter; and "thickness" the greatest diameter at right angles to this

Loc.—Valley of Kelat (Dr. Cook).*

Associates.—*Assilina exponens* with varieties *a* and *b*, *A. obesa*, n. sp. *Nummulites Carteri*, *N. Biaritzensis*, *N. perforata*, *Alveolina elliptica*, *Orbitoides dispana*, *Conulites Cooki*.

"2. *A.*———?" (Ann. 168).—This has been rightly identified by d'Arch. et Haime (p. 343), with *N. exponens*; that is to say, the species so well described and figured by them (p. 343, pl. x.). But there are two varieties, besides the typical form, viz. *N. exponens*; and in the diagram which I have given (Ann. pl. vii. fig. 7), the size of the first variety of this fossil, which I shall now describe (viz. *a*), has been represented with the external markings of the typical form.

Largest size.—Breadth $\frac{1}{2}$ inch (28 $\frac{1}{2}$ millim.)

Loc.—Lukput, in Cutch (Mr. Smith).

Associates.—*N. Biaritzensis*, *Alveolina elliptica*, *Orbitoides dispana*.

Variety *a*.—This differs from the foregoing in being broader, comparatively thinner, presenting more turns in the spire and narrower chambers, with a greater irregularity in both than in the typical form (*N. exponens*), and therefore, a consequent greater irregularity in the external indications of the turns, which are also less marked.

Largest size.—Breadth $\frac{1}{2}$ inch (43 millim.) Number of turns altogether, 30; and 19 in a radius of 11 millim. The typical form given by d'Arch. et Haime is 30 to 35 millim. in diameter, with 16 turns in a radius of 11 millim.

Associates.—*N. spira*, *N. perforata*, *Alveolina elliptica*.

Variety *b*.—This is still broader and thicker than the last variety (*a*), while the spire and chambers, in the horizontal section, more nearly approach that of the typical form. Externally it is smooth, [the indications of the septa are not raised as in the typical form,] wavy, diminishing gradually in thickness from the centre which is plane, [not depressed as in the typical form,] to the margin which is thin. Presenting a circular, white, central portion, in which the markings of the septa, &c. are undistinguishable, but beyond this with the spicular cord become evident in the form of unraised white lines which more or less disappear again half way between the centre and

* Dr. Cook, Bombay Army, late Medical Officer to the British Agency at Kelat. The name thus attached indicates the source from which the fossil was obtained.

the circumference. Spicular cord more marked than the septa, which are almost straight, and after three or four turns only appear in fragments attached to the inner side of the cord, at right angles, so as to present the appearance of Hebrew characters. In the typical form the septal lines are strongly marked and slightly curved, beginning at the centre, but the spicular cord, for the most part, not indicated externally; while in the first variety, (viz. *a*.) there is a slight approach to the opposite state in which these parts present themselves in the second variety. Internally, the spicular cord is much thicker and the chambers larger than in the second variety or typical form. In short, it is, if not a different species, a large, coarse form of *N. exponens*.

Largest size.—Breadth, $\frac{1}{2}$ inch, (51 millim.) Thickness $\frac{2}{18}$ inch, ($3\frac{1}{2}$ millim.)

Loc.—Valley of Kelat, (Dr. Cook). Upper Sind, (Col. Turner).

Associates.—*Assilina obesa*, *N. spira*, *N. perforata*, *Orbitoides dispansa*, *Conulites Cooki*, *Alveolina elliptica*.

3. *Assilina obesa*, n. sp.—Discoidal, thick, plane towards the centre, abruptly thin towards the margin which is sharp and wavy. Presenting a group of white puncta more or less approximated towards the centre which become scanty and scattered in the opposite direction, where they chiefly pass into irregular, curved lines, that, with a circular, linear fragment here and there, indicate respectively, the subjacent septa and spicular cord. *Internal structure*.—Turns of the spire broad, slightly approximated towards the margin, commencing from a large central cell. Spire single throughout, but more or less irregular in course; septa curved, reflected. Chambers vary in size, but generally a little longer in the direction of the spire than across it. No lateral prolongation of the chambers towards the centre, over the surface of the foregoing turns.

Largest size.—Breadth $\frac{5}{12}$ inch (11 $\frac{1}{4}$ -millim.) Thickness $\frac{1}{4}$ (4 millim.) Number of turns in the spire, 7-8.

Loc.—Valley of Kelat, (Dr. Cook). Upper Sind, (Col. Turner).

Associates.—*Assilina* seu *N. exponens*, (varieties *a* and *b*), *N. Carteri*, *N. perforata*, *N. spira*, *Orbitoides dispansa*, *Conulites Cooki*, *Alveolina elliptica*.

Obs.—The approximation of the outer turns of the spire here, as in other full-grown nummulites, indicates the limit of the size, in the locality, though not always the limit generally, and so far separates it

from the foregoing *Assilina*; but a more decided difference exists in the greatest width of the chambers being in the direction of the spire instead of across it. This, while it agrees with the "Punctulatæ" of d'Arch. et Haime, is the very opposite of what is found in *N. exponens* and its varieties. The central cell and turns of the spire are much larger than they are in *N. exponens* and *N. spira*, where there are 6 within a radius of $\frac{1}{8}$ inch, while in *A. obesa*, there are only three.

Note.—I still prefer the generic name of "*Assilina*" for these Nummulites, although they appear to me to be rightly placed by d'Arch. et Haime in a distinct "Group," viz. the "Explanatæ;" but the chambers being confined to the horizontal plane cause them to differ from *Nummulites* almost as much as the latter from *Operculina*; from which again it is much more difficult to separate *Assilina* than *Assilina* from *Nummulites*. It is only their greater size and thickness which; making them nummi-form, appears to ally them to *Nummulites*. If *N. spira* were called "*Assilina spira*," its fundamental structure would be understood at once, while *Nummulites spira* would imply quite a different type. Besides, by using the term "*Nummulites*" for all, we require so many more "specifics;" whereas the same specific would do for two species if the family name were different. Thus, there is a *Nummulites obesa*, but I want this term of designation for another form of nummulite, which I could not use, were it not called *Assilina*.

NUMMULITES.

"1. *N.* ——— ?" (Ann. p. 169).—This large nummulite has been called "*N. Carteri*" by d'Arch. et Haime, (p. 344), but only "provisionally," as these authors did not feel certain that it was not a variety of *N. perforata*. Subsequent examination however, in comparison with their descriptions of the "Punctulatæ," leads me to consider it decidedly a different species, and therefore, I will now describe it more particularly.

N. Carteri, d'Arch. et Haime.—Discoidal, equilateral, thin, flat or wavy, gradually diminishing in thickness from the centre towards the circumference. Septal lines tortuous, more or less branched, arranged irregularly in whorls here and there on the surface; attached to and having between the lines more or less white puncta. *Internal structure.*—Turns of the spire and chambers very numerous and very

irregular, the latter narrower in the direction of the spire than across it, and much reflected.

Largest size.—Breadth, $2\frac{1}{2}$ inches (64 millim.) ; thickness, $\frac{1}{2}$ inch ($1\frac{1}{2}$ millim.) Turns of the spire altogether, about 45.

Loc.—Upper Sind, (Col. Turner).

Associates.—*Assilina exponens* (var. *b*), *A. obesa*, *N. spira*, *N. obesa*.

Obs.—This may be generally termed a "large, thin nummulite." Its greater breadth, thinness, irregularity of spire and greater number of chambers, which are more reflected, narrower, and have their longest diameter across, instead of in the direction of the spire, even to within a few of the outer turns, separate it from *N. perforata*, as well as from *N. Sismondai*, and indeed from all the "Punctulatæ" figured by MM. d'Archiac and Haime, except the Sindian species called *N. obtusa*, which although agreeing with *N. Carteri* in the narrowness of its chambers continued towards the margin, and thus also differing from all the other "Punctulatæ" except *N. curvispira*, nevertheless markedly differs from *N. Carteri*, like the other "Punctulatæ," in all the other points mentioned. Some specimens are so thin that they may be termed "papyraceous," but they still present compressed cells above and below the central plane, as may be seen by making vertical sections of them. Again, in some localities, they appear to be stunted in their growth, if, as before stated, the approximation of the outer turns of the spire may be taken as a sign of full-development, for I possess full-grown specimens with approximated turns of the spire which are not more than half the diameter of the largest forms.

On the other hand, in comparing young specimens of *N. Carteri* with those of *N. perforata* of equal breadth, viz. 3-24ths of an inch, it will be observed that, while the whole of the white puncta are gathered together in the centre of the former, they are more or less scattered, and separate, in the latter.

So far as the specimens of *N. perforata* which Dr. Cook sent from the valley of Kelat go, *N. Carteri* is not present with them ; although it is associated with *N. perforata* in Upper Sind.

In some specimens of *N. Carteri* the wearing down of the softer substance of the test and the septal lines has caused the harder portions or puncta to project in such a manner, as to render the fossil so much like *N. Brongniarti*, (d'Arch. et Haime, pl. v. fig. 1, &c.), that at first sight they would be said to be the same species in this respect. Again, it was my inattention to the exact position of these puncta, which did not form specific distinctions before MM. d'Archiac and Haime wrote

their "Work," that led me in the figure which I gave of this nummulite to place all the puncta between the septal lines (Ann. pl. vii. fig. 9), and MM. d'Arch. et Haime, on this account, to liken it to *N. perforata*; whereas it really is more like *N. Sismondai*, for puncta are not only scattered between the septal lines but attached to them as above mentioned. We shall soon see, however, that the presence or absence of these puncta in specimens of the same species renders this distinction of less value specifically perhaps, than it may be generically.

The spire and columns of *N. Carteri* are perhaps most like that given by d'Arch. et Haime of *N. distans*, (pl. 2, fig. 2 and 2 a)—one of their group, "Læves et Sublæves," while *N. Carteri* generally, is the nearest approach to this "group" which Sind produces, at least so far as my knowledge extends.

"2. *N. millecaput*?" (Ann. p. 169).—This has been identified by d'Arch. et Haime (p. 343) with *N. Gyzehensis*, one of their group of "Læves et Sublæves." It came from Egypt, and was merely inserted among the Sind specimens for comparison. As yet, I have not seen a single specimen of this group from Sind.

"3. *N. obtusa*, Sow.," (Ann. pl. vii. fig. 13).—This has been identified by d'Arch. et Haime (p. 343), with the fossil from Cutch described by Sowerby under this name; chiefly, I presume, from my figure being without "puncta" on the surface, and thus these authors have again been led into error so far as the figure goes, for in the nummulite from which it was taken I now find there are abundance of puncta, although in the smaller specimens from which the description was made, there are only one or two, here and there, attached to the septal lines. Moreover, I find that all the specimens which I now possess, and which, respectively, come from the valley of Kelat and various parts of Sind, have that striking character (according to d'Arch. et Haime) which distinguishes all the other "Punctulatæ" except *N. curvispira*, from *N. obtusa*, viz. the great increasing diameter of the chambers in the direction of, over that across, the spire, towards the margin. In d'Arch. et Haime's figure of *N. obtusa* (pl. vi. fig. 136), the chambers, in relative proportion, are nearly the same throughout; in which case I have never yet seen a specimen of this nummulite from Sind or elsewhere.

The presence of the puncta again, or their absence; their attachment to the septal lines or their separation from them; or the existence of both in the same specimen; or indeed the absence of the septal

lines altogether and the presence of an abundance of pores may exist respectively, in the different forms of the genus *serotina*, viz. *N. perforata*, which abounds in the valley of Keokuk and Sand, showing that much dependence, as I have just stated, must not be placed on the pores in several lines for specific distinction. How much the diameters of the pores in their white, opaque form, may depend on the compactness of the material of which the shell is composed, I am ignorant, but it seems to me that the harder and darker it is the more evident are the pores, while the lighter and more chalky, the more indistinct, until they disappear altogether. Still, this is not always the case, since in the specimens from Keokuk which are all equally hard, the pores are sometimes wanting, when the form of the chambers of the central plane proves them otherwise, to be of the same species. That all these variations may depend either all on fossilization may easily be conceived, from the pores in the first instance being the most transmissive parts of the test as shown in *Thurstonia*. However, to avoid further confusion, I will now give a more complete description of the individuals that I could be positively assigning to it the name of *N. serotina* rather than that of *N. nitens*, as I think the former will be found the best adapted for it.

N. serotina. L'Am. Planch. et Haime, p. 1. n. 1. — Globular, or discoidal and compressed, presenting several whorls of white spiral lines on the surface more or less crowded, sinuous, imbricated, and mixed with more or less pores, which may be attracted in its separation from the lines or even present without the lines, presenting in some instances a striated-work of minute lines radiating from the pores, and also extending from the spiral lines across the central spaces. Internal structure. — Some regular lines converging towards the circumference in proportion to the diameter of the specimen. Chambers as long as wide about the center, becoming much longer in the direction of the spiral lines across it towards the circumference.

Lengths and breadths. — *N. nitens* variety, breadth, $\frac{1}{2}$ inch. 100 millims., thickness, $\frac{1}{4}$ inch. 14 $\frac{1}{2}$ millims. *N. serotina* variety, breadth, $\frac{1}{2}$ inch. 100 millims., thickness, $\frac{1}{4}$ inch. 10 millims. *N. nitens* variety, breadth, $\frac{1}{2}$ inch. 100 millims., thickness, $\frac{1}{4}$ inch. 10 millims.

Found in the Keokuk. Taken at Keokuk, Dr. Cook.

Another specimen at Keokuk was taken by K. Harris. It is different from the Keokuk specimen. Found at Keokuk, Dr. Cook.

Obs.—As this nummulite has all the forms, viz. globose and flat, of *N. perforata*, and at one time the same external markings, while at others not, which, as before stated, makes the latter of little specific value; while in the form of its chambers, their increase in diameter in the direction of the spire, and the increase in number and approximation of the turns of the spire, towards the circumference, more especially in the globose forms, I think we must set down this fossil as *N. perforata*. There is so little difference however, between some of the flatter forms and *N. Brongniarti*, *N. Verneuili*, and *N. Simondai* (d'Arch. et Haime), that it might occasionally be taken for either of them.

MM. d'Archiac and Haime also state (p. 117), regarding *N. perforata*:—"Les nombreux individus que nous avons observés qui provenaient tous d'une même localité, présentaient à l'extérieur un teinte violette, beaucoup faible en dedans. C'est d'ailleurs, le seul exemple de coloration que nous ayons observé dans les Nummulites, et qui puisse être regardé comme ne provenant pas d'une circonstance étrangère." This happens to be the case, so far as regards the colour, with most of the "Punctulatæ" which Dr. Cook sent from the Valley of Kelat (a great number); but it is not confined to them, for the other Foraminifera, viz. *Assilina obesa*, n. sp., and *Orbitoides dispansa*, which are associated with them are in like manner, and equally violet-coloured, while the same species from parts of Sind associated with the same kind of Foraminifera are more or less without colour; hence I am inclined to think that the violet colour in the Kelat specimens is derived from the material in which they were imbedded, for it only extends a little deeper than the surface of the nummulite, and this material is coloured more or less red or yellow by the presence of much oxide of iron; while most of those from Sind, which are colourless, are imbedded in white or greyish limestone.

N. Broachensis, Cart.—Discoidal, thick; margin angular; surface smooth, presenting puncta arranged spirally without striæ. Spire regular; chambers increasing in diameter with the direction of the spire over that which is across it, towards the circumference; septa curved, reflected.

Largest size.—Breadth, $\frac{5}{48}$ inch; thickness $\frac{2}{48}$ inch. Number of turns in the spire altogether, 6.

Loc.—Wasna, a little village in Rajpipla, about fifteen miles E. S. E. of Broach, and about five south of Ruttunpoor (Major Fulljames).

Associates.—*N. Ramondi*, *Orbitoides dispansa*, *Operculina*.

Obs.—This little nummulite, which was first described in my "Geological Papers of Western India," (p. 697,—1857), is smaller than *N. Lucasana*, d'Arch. et Haime (pl. viii. fig. 5); the long diameter of the outer chambers is relatively greater, and the puncta tend to a concentric arrangement, with but slight appearance of the septal lines. Possibly, as the outer turns of the spire are *not* approximated, it may be the young of a larger size. I have designated it "*Broachensis*," to record the existence of Eocene Strata near this town; and *not* "fifty miles up the Nurbudda" on the north side, as stated (*loc. cit.*) by mistake. Pieces of yellow, argillaceous limestone were brought from Wasna to the late Major Fulljames, containing this fossil, *N. Ramondi*, *Operculina*, and *Orbitoides dispansa*, and he transmitted them to me. These are the specimens to which I have alluded, as being so richly infiltrated with red or yellow oxide of iron as to afford an unerring guide to their internal structure respectively.

PLICATÆ vel STRIATÆ, d'Arch. et Haime.

1. *N. Biaritzensis*, d'Arch. et Haime, (p. 131).—None of this "Group" of Nummulites were noticed in my first "Paper."

Largest size.—Breadth, $\frac{6}{12}$ inch ($19\frac{1}{2}$ millim.); thickness, $\frac{2\frac{1}{2}}{12}$ inch (6 millim.).

Loc.—Valley of Kelat, (Dr. Cook). Booghtee and Murree Hills and Sukkur, (Dr. Malcolmson). Lukput, (Mr Smith).

Obs.—All the specimens that I possess from the different localities mentioned must be referred to *N. Biaritzensis*. They are characterized externally by a single bunch or whorl of septal lines flowing in a sigmoid form from an eccentric point on the disk, towards the circumference (see fig. 5, pl. viii. d'Arch. et Haime); and internally, by the regularity of the spire and the chambers, which are much reflected and continue longer across, than in the direction of, the spire, even to the circumference.

Here again there are so many varieties, and the species described by d'Arch. and Haime are so much alike, that it has been exceedingly difficult for me to identify all those which I possess with *N. Biaritzensis*. Nevertheless, after careful comparison, this has been the conclusion to which I have arrived.

The value of the number of chambers in one-fourth of a turn half the radius of the fossil from the centre or circumference, is only of use where the specimens happen to be of the same size as that from which

the typical description is given, since the number of chambers vary in the different turns, and the further the turn is from the centre the more numerous the chambers. Thus, if a specimen of *N. Biaritzensis*, 12 millim. in diameter, has 8 chambers in one-fourth ($\frac{1}{4}$) of a turn, half the radius of the fossil from the centre, the specimen of less breadth, which perhaps is the only one possessed, will have less chambers in the $\frac{1}{4}$ of a turn, half the radius from the centre. Hence there are many chances to one that the typical size is possessed, and thus this character may be of very little service.

The largest or mean diameter again of the specimen requires such an immense number for deduction, that this also is of little use. There appears to me to be no possibility of ascertaining how large any species of nummulite may be under a certain limit, for every day, so to write, seems to bring us a larger one; while the test of full-development, to which I have alluded, viz. the approximation of the outer turns of the spire, is only that of the full-development or largest size of the locality.

At one time I thought the striated nummulites which I possess from Kelat and Sukkur might be referred to either *N. Biaritzensis* or *N. Viquesneli*, while the striated nummulites from the Booghtee and Murree Hills closely resembled *N. Beaumonti*. The "posterior superior angle" of the chambers in the Booghtee specimens *not* being "almost rectangular," and the septa consequently being much, instead of "little arched," leaving the decision in favour of *N. Biaritzensis*.

With none of the nummulites described and figured in d'Arch. et Haime's "Work" have I had such difficulty in identifying my specimens as with the "Plicatæ vel Striatæ."

2. *N. Ramondi*, Defr. *nihi* (d'Arch. et Haime, p. 218).—Discoidal, thick; margin angular, wavy; surface smooth, marked with radiating septal lines for the most part unbranched, flowing in a somewhat sigmoid form from the centre to the circumference. Spire very regular, chambers numerous, narrower throughout in the direction of the spire than across it; septa slightly curved, reflected.

Largest size.—Breadth, $\frac{2\frac{1}{2}}{12}$ inch; thickness, $\frac{1}{12}$ inch; number of turns in the spire altogether, 9, but the outer turns not being approximated, I doubt if this be the full-grown size.

Loc.—Wasna (Major Fulljames).

Associates.—*N. Broachensis*, *Operculina*, *Orbitoides dispansa*.

Obs.—This little nummulite was first described in my "Geological Papers on Western India," p. 696.—1857. For remarks applying to locality, &c., see "*Obs.*" to *N. Broachensis*, with which it is

associated. From the richness of the infiltration of red and yellow oxide of iron in this species, I have, as before stated, been able to make out its internal structure even better than if it had been a recent specimen. The whole is identical with that of *Operculina Arabica*, plus the extension of the chambers to the centre, on both sides of the horizontal plane, which additional structure is but a repetition in plan of the horizontal one. Even the lines indicating the spicular composition of the marginal cord are visible, although longer than those of *Operculina*, but to this I have already more particularly alluded, and therefore need not repeat it again here.

3. *N. Makullaensis*, n. sp.—Discoidal, rather thick than thin: margin obtuse. Surface presenting a number of papillæ, grouped towards the centre, from which delicate curved septal lines pass off to the circumference. Internally,—spire regular, turns wide and few in number; chambers very narrow in the direction of the spire; septa much curved and much reflected.

Largest size.—Breadth, $\frac{2}{10}$ inch; thickness $\frac{1}{16}$ inch; number of turns, five.

Loc.—Makulla on the S. E. coast of Arabia. In pinkish limestone.

Obs.—This is an insignificant nummulite, but still it is a nummulite, and therefore, shows that the limestone at Makulla is of Eocene Era. (See "Geological Papers of Western India," p. 614, foot-note.) Its granulated surface at first appears to claim a place for it among the "Punctulatæ," but the curved septal lines on the surface, and the curved and reflected septa themselves internally, together with the narrowness of the chambers throughout, make it rather belong to the "Plicatæ vel Striatæ." I see no nummulite in d'Arch. et Haime approaching it except the last of this group, viz. *N. Heberti*. To record the existence of a nummulite in the limestone at Makulla, I have described, and named it after that town, rather than from anything striking or interesting in the fossil itself.

N. Kelatensis, n. sp.—Discoidal, compressed, wavy, septal lines on the surface thin and approximated, gyrating from white irregular puncta in the centre to the circumference. Internally,—spire remarkably regular, turns numerous, chambers slightly reflected, bearing the same relative proportions throughout the disk; septa straight, or nearly so, and slightly reflected.

Largest size.—Breadth $\frac{3}{12}$ inch; thickness, $\frac{3}{48}$ inch; number of turns in the spire, eleven.

Loc.—Valley of Kelat (Dr. Cook).

Obs.—The number of septal lines on the surface; the number of chambers internally; the regularity of the spire and its number of turns; but especially the straightness of the septa, separate this from *N. Biaritzensis*, and from all the “*Striatæ*” figured by d’Arch. et Haime. I have called it “*Kelatensis*,” from its being known to me in no other locality. The last turns of the spire being the broadest in the largest specimen which I possess leads me to think that it probably attains a larger size. It comes from a deposit of many kinds of small foraminifera, viz. *Orbitoides dispansa* (the stellate variety), *Alveolina elliptica*, (small variety), *A. meandrina*, *Operculina* and *Orbitolina*, all of which are of diminutive size.

N. irregularis, Desh. (d’Arch. et Haime, p. 138).

Largest size.—Breadth, $\frac{7}{12}$ inch; thickness, $\frac{1-1\frac{1}{2}}{12}$ inch; number of turns, seven.

Loc.—Valley of Rodinjo which joins the Valley of Kelat (Dr. Cook).

Obs.—The only specimens which I possess of this nummulite were sent to me by Dr. Cook with some of *N. Biaritzensis*; both from the Valley of Rodinjo; but whether they were found together or in separate localities I am ignorant.

RETICULATÆ, (d’Arch. et Haime).

“*Nummularia acuta*, (?) Sow.” (Ann. p. 171).—This, by the aid of MM. d’Arch. et Haime’s Work, I am now able to identify with *N. Sublævigata*, d’Arch. et Haime (p. 106).

Largest size.—Breadth $\frac{1}{2}$ inch (20 millim.); thickness, $\frac{2\frac{1}{2}}{12}$ inch.

Loc.—Kurrachee (Dr. Rook). Sind (Capt. Partridge). Muscat in Arabia (Capt. Newbold).

Obs.—The reticulated structure of this nummulite, into which the septal lines pass, begins close to the margin, and hence, according to d’Arch. et Haime’s classification, it ought to belong to their “*Reticulatæ*” or 2nd group; whereas they have placed it among the “*Subreticulatæ*, or 3rd group, which is distinguished from the 2nd, by the reticulation commencing in simple, flexuous lines at the margin, first. Nevertheless, I cannot consider these nummulites, on account of the localities in Sind from which many of them were obtained, being the same as those from which the specimens of *N. Sublævigata* described by d’Arch. et Haime came, their internal structure being the

same, and other circumstances which will be stated presently,—as belonging to any other species than *N. Sublævigata*.

Hence I question, whether it would not have been better for these authors to have made only one group of the reticulated nummulites, and thus to have included all under the head of their second group or “Reticulatæ,” instead of adding a third, viz. “Subreticulatæ.” The last group seems to me to be superfluous and confusing, especially as the species of “Reticulatæ,” like those of all the other groups, have, for the most part, so little difference between them that their division is equally perplexing.

All the specimens that I have, from Sind and Muscat respectively, are in a yellow, argillaceous limestone, and those of *N. sublævigata* from which d'Arch. et Haime made their description, were in “calcaires marneux, jaunâtres de la chaîne d'Hala (Sinde),” thus they appear to have come from corresponding parts of the same series. Now this series at Muscat, which is immediately opposite Kurrachee, on the other side of the gulf of Oman, successively consists, from below upwards, of:—conglomerate; variegated sands (the yellow colour chiefly prevailing); variegated coloured clays, also chiefly yellow; argillaceous limestone; ending with pure, compact yellowish limestone;—and assuming that the Nummulitic Series in the neighbourhood of Kurrachee and of the Hala Mountains to be the same, it would follow, from the composition and colour of the material in which these nummulites are imbedded, that they come from the lower part of the series. Hence the “Reticulatæ,” or at least *N. sublævigata*, may be among the oldest of the large nummulites. Unless this part of the series be a middle tertiary one, since d'Arch. et Haime (p. 79) state that the reticulated form named *N. Garansensis* comes from the “first deposits of the middle tertiaries” in the north-west part of the Pyrenees. And indeed it has always struck me that the yellow series of Lower Sind and of Muscat, including that of the island of Masira on the S. E. coast of Arabia, which is the same as that of Muscat, was of a later date than the great “white” limestone formation of Upper Sind, and that of the more elevated portions of the S. E. coast of Arabia, respectively. Whether or not this is a fact, remains to be proved.

The only large foraminifer associated with *N. sublævigata* that I have found is *Orbitolites Mantelli* (*Orbitoides Mantelli*, d'Orb.); and the latter fossil again, I have never found in company with any other nummulite.

The diagram of “*N. acuta*” which I have given (Ann. v. x, pl. iv, fig. 9), to show that the same canal-system existed in *Nummulites* as in

Operculina, was compiled from sections of what we must now regard with the rest, as *N. sublævigata*, for, besides being exactly like the rest, they came from Siud, and from their being imbedded in an impure, yellow, argillaceous limestone, probably came also from the lower deposits of the nummulitic series, if not from the "Hala Range" itself. It is among these that the specimens of *Orbitolites Mantelli* are found to which I have just alluded.

Lastly, I would observe, that the nummulites brought by the late Captain Newbold from Muscat belong to the species called *N. sublævigata* and not to "*N. obtusa*," as stated by me formerly. The error therefore into which d'Arch. et Haime have thus been led (p. 123), should be corrected, by transferring what they have stated to the "Localités" of their *N. sublævigata*.

N. Masiraensis, n. sp.—Discoidal, wavy, with a tendency to sudden elevation in the centre. Septal lines reticulated but not densely, and in some instances almost tending to radiation from the centre. Internal structure presenting the regularity in the spire and lengthening of the chambers in the direction of, instead of across, the spire, characterizing the "Reticulatæ" generally.

Largest size.—Breadth $\frac{1}{4}$ inch; thickness, $\frac{1}{8}$ inch. Number of turns, seventeen.

Loc.—Island of Masira, on the S. E. coast of Arabia.

Associates.—The only nummulite associated with *N. Masiraensis* is a small thick form which appears to be merely younger ones of the same species, which in their semi-globose figure contrast strongly with the thinness of the young specimens of *N. sublævigata*.

Obs.—At first I thought this was *N. Garansensis*, Joly et Leym, and so called it (Geol. Pap. on Western India, p. 544 and 572); but on closer examination, assisted by d'Arch. and Haime, I find it from its open reticulation, not to be that species, but to belong to their "Subreticulatæ." The figure which I have given of it (Ann. pl. vii, fig. 19) is evidently, as these authors have stated (p. 343), "une coupe d'Orbitoïde;" that is to say, the representation of the vertical section (fig. 20), in which, by some oversight, the layers on either side of the central plane, characteristic of nummulites, have been omitted.

In the spire, *N. Masiraensis* closely corresponds with *N. sublævigata*, and thus differs in this respect from *N. Garansensis* as much as *N. sublævigata*. Then again it is much larger than *N. Garansensis*, and does not present the "sub-pustuliform pores" (d'Arch. et Haime,

pl. iii. fig. vii.). That I have the largest size (at all events of the locality) is proved by the approximation of the outer turns in the largest specimens.

It differs from *N. sublævigata* in being smaller; in the septal reticulation being more open; and in the young ones being semi-globular instead of thin, which they are in *N. sublævigata*. There is, however, the same tendency to sudden elevation in the centre which appears to be common to all the "Reticulatæ."

These nummulites are imbedded in a loose, calcareous, gritty sandy deposit of a pinkish colour passing upwards into a whitish compact limestone (see Geol. Pap. Western India, p. 571).

In the Museum of the Asiatic Society of Bombay is a slab of pink arenaceous limestone richly charged with a reticulated nummulite so closely allied to *N. Masiraensis* that I think it is the same species. It is accompanied by numbers of *Orbitoides dispansa*, and a small nummulite belonging to the "Striatæ," all of which retain their whiteness, while the limestone in which they are imbedded is of a deep pinkish colour. The locality from which the slab came is unknown, but the colour and composition of the matrix, together with the reticulated nummulite, closely corresponds with the Masira bed in these respects, although there is not the remotest probability of its having come from that island.

N.—————? Thin, compressed. The reticulated structure commencing at the margin. Spire regular, chambers lengthening in the direction of the spire towards the circumference.

Largest size.—Breadth, $\frac{2\frac{1}{2}}{13}$; thickness, $\frac{1}{12}$; number of turns, 11.

Loc.—Ras Khoriat, on the mainland of the S.E. coast of Arabia, nearly opposite the island of Masira.

Obs.—I have examined and described this small nummulite chiefly to record the existence of the Nummulitic Series at this point of the S. E. coast of Arabia. Although nearly opposite, and very close to, the island of Masira, and a reticulated form, it is not *N. Masiraensis*, as the thinness compared with its breadth proves. It is probably the young of a species which attains a larger size, as the specimens are very small and the outer turns of the spire not approximated. In thinness it corresponds with *N. intermedia* (d'Arch. et Haime, pl. iii, fig. 3); and is found in a white, chalky deposit.

ALVEOLINA, d'Orb.

"3. *Fasciolites elliptica*, Park" (Ann. p.171).—*Alveolina elliptica*, d'Orbigny (d'Arch. et Haime, p. 349).

Largest size.—Length, $\frac{7}{12}$ inch ; breadth, $\frac{8}{12}$ inch.

Loc.—Lukput in Cutch. Sind, in many parts. Valley of Kelat (Dr. Cook). Bolan Pass (Dr. Leith).

Associates.—*Orbitolites*, on the S. E. coast of Arabia (mis-quoted "*Orbitoides*" in d'Arch. et Haime, p. 349). *Orbitolites* in abundance and a small nummulite (like *N. Kelatensis*), belonging to the "*Striatæ*," on the Buran River in Sind. With *N. exponens*, *N. Biaritzensis*, and *Orbitoides dispansa*, at Lukput in Cutch. With *Nummulites* and *Orbitoides*, in the valley of Kelat.

Obs.—The typical structure of this foraminifer I have given (Ann. v. xv, p. 99), since which I have received much larger specimens. The largest elliptical form that I have seen was brought to me from Lukput in Cutch ; the next in size from the valley of Kelat. Both are nearly of the same, and equal in size to that given by Sowerby (Grant, Geol. Cutch., Transac. Geol. Soc. Lond. v. v. Second Series). At Tatta in Sind, a great bed of the spheroidal form (*A. spheroides*) exists. At Hydrabad, on the Buran River, and in many other parts of Sind, a small, narrower, elliptical variety, is more or less present. On the S. E. coast of Arabia the melanoid form (*A. melanoidea*) occurs with *Orbitolites* as above stated.

Here, again, a great variety in the same species of foraminifer appears to me to occur. Thus, at Lukput, the Alveolina is $\frac{7}{12}$ inch long by $\frac{3}{12}$ broad, and rounded at the ends. At Kelat the largest is about the same size, but pointed at the ends. All the elliptical *Alveolinæ* about Hydrabad and many other parts of Sind appear to be but diminutive forms of the *A. elliptica* of Lukput, although they seldom exceed in length even the breadth (viz. $\frac{3}{12}$ inch) of the Lukput one, with $\frac{1\frac{1}{2}}{12}$ inch for the short diameter. While the spheroidal forms with the same length (viz. $\frac{3}{12}$ inch) appear to pass into the elliptical on one side, and the melanoid forms on the other. So that if all these sizes were found together in one bed, they could hardly be considered otherwise than as varieties of one species ; nor is there in their separation, anything to oppose this beyond the prevalence of the spheroidal, the diminutive narrow, elliptical, and the large size, almost exclusively, in their respective localities. The late Mr. Loftus found one in Persia 3 inches long and $1\frac{1}{2}$ broad (Ann. v. 5, p. 182.—1860). Thus *Alveolina* presents another instance among the foraminifera of great variety in the same species, and the difficulties of determining which are species and which varieties.

The internal structure of *Alveolina elliptica* is exactly that of *Nummulites* elongated vertically, with the exception of the layers of

spicules of which the spicular cord is composed in the latter, being separated into ridges in the former, and the septal divisions instead of stopping at the spicular cord being carried through it, in *Alveolina*; while the intervals between the ridges appear to correspond to the layers of anastomosing canals or marginal plexus in the cord of *Nummulites*. I have never been able to see any traces of spicules or of a marginal plexus in the marginal or canaliferous layer, as it may be termed, of *Alveolina*; then I have not yet met with any richly infiltrated specimens to enable me to determine this, as in *Nummulites*. Next, in proportion as a nummulite becomes thick the external turns of the spire are more approximated, until, in the globose forms, they are almost as much in contact as in *Alveolina*, that is to say, there is hardly any space for chambers left; hence their approximation becomes greatly increased when the globose passes into the elliptical form, as in *Alveolina*, where there is no space at all left for the chambers; while the turns of the canaliferous layer which correspond as before stated to the spicular cord of *Nummulites*, are thus brought into direct contact with each other. But this approximation, although chiefly occurring in the outermost layers in *Alveolina*, is not always confined to them, as it sometimes commences from the first cell and is continued throughout; while in others it begins with the spire, and ceasing after two or three turns, is followed by a turn or two of chambers, and then again the canaliferous layers become approximated. So, one might fairly infer that the functions of the soft structures of the canaliferous layer and that of the soft structures filling the chambers were different, for it is evident that the former went on growing without the presence of the latter; (and, indeed, it would be difficult to make out any chambers in many of the globose forms of *N. perforata* towards the circumference); but the chambers do not appear in like manner, *without* the presence of the canaliferous layer.—Hence, as before stated, may we not infer that the latter contains the developing part of the organism, and the former the reproductive one?

Alveolina meandrina, n. sp.—Elliptical, nearly globular; externally covered with whorls of tortuous septal lines and interspaces, indicating the form of the chambers beneath; internally, composed of a spiral layer of long, narrow, tortuous chambers commencing from a central cell and gradually elongating themselves in each direction, at right angles to the spire, as the latter winds round its long axis to form the test; each chamber extending from pole to pole, and each layer covered with a cortical, tubular reticulation.

Largest size.—Length, $\frac{1}{2}$ inch ; thickness, $\frac{1}{8}$ inch.

Loc.—Valley of Kelat (Dr. Cook).

Associates.—Found in the bed of diminutive foraminifera mentioned under the head of *N. Kelatensis*.

Obs.—The *Alveolina*, viz. (*A. Boscii*), described and illustrated by Dr. Carpenter, (Phil. Trans. 1854) is classed by him with *Orbitolites*, or d'Orbigny's "Cyclostègues." That which I have described under the name of *A. elliptica* must be classed with *Nummulites* or the "Hélicostègues" of d'Orbigny. It begins spirally from a central cell like *Operculina*, &c., and as the chambers increase so they become extended vertically on both sides, but go beyond the sigmoid form of the chambers of *A. elliptica* in becoming tortuous, so that the surface of the test presents the wavy appearance of the surface of *Nummulites Gyzezensis* when the superficial encrustation is dissolved or rubbed off. A canal-system can also be easily perceived at the commencement which follows the margin or surface of the spiral lamina and the interseptal spaces, respectively, assuming a reticulated structure in the former, supported on a series of straight canals in the latter, which seem respectively, also, to answer to the horizontal and interseptal canals in *A. elliptica*, and to the marginal plexus and interseptal canals in *Operculina* and *Nummulites*.

ORBITOIDES, d'Orb.

"*Lycophris dispansus*, Sow." (Ann. p. 172), better named by d'Arch. et Haime (p. 349), "*Orbitoides dispansa*."

Largest size.—Breadth, about 1 inch ; thickness, $\frac{1}{8}$ in.—This specimen is ephippial.

Loc.—Lukput in Cutch. Many parts of Sind. Valley of Kelat (Dr. Cook). Not in Arabia, so far as my observation extends, although I have no doubt it exists there ; but I mention expressly that, I have not seen it in Arabia, to correct an error which I have made in my Memoir on the Geology of the S. E. Coast of that country (Geol. Pap. Western India, p. 592, *et seq.*), in stating that the limestone at the village of Takah on this coast, which is charged with *Orbitolites Mantelli*, contained also "*Orbitoides Prattii* and *O. dispansa*," which latter I have since found out to be *Heterostegina*, whose quadrangular chambers, while the fossils were yet in the matrix, led me to assume that they were orbitoides, and thus make the mistake.

Associates.—*N. exponens* and *N. Biaritzensis* at Lukput in Cutch. *N. Ramondi* at Wasna in Rajpipla. *N. exponens*, *Assilina obesa*, *N. perforata*, *Alveolina elliptica*, and *Conulites Cooki* in the valley of

Kelat (Dr. Cook). The deposit of diminutive foraminifera, viz. *Operculina*, *N. Kelatensis*, *Alveolina elliptica*, *A. meandrina*, and *Orbitolina*, also in the valley of Kelat (Dr. Cook).

Obs.—In my former description of this fossil (Ann. p. 173), I went into its structure a little, chiefly to contrast the latter with that of *Orbitolites Mantelli*, Cart. (*Orbitoides Mantelli*, d'Orb.); but having since obtained specimens which elucidate this more fully, on account of the whole of the cavities of the test, which formerly contained animal matter, having become richly infiltrated with red and yellow oxide of iron, while the rest remains perfectly free from it, I will now return to the subject more particularly; in doing which, I shall not only be able to show much more strikingly how it differs from *Orbitolites Mantelli*, but be able to point out the position occupied by the sarcode during the life-time of the animal, almost as satisfactorily as if I had it living in the test at the present moment.

Structural description.—In structure, *Orbitoides diapansa* consists of a horizontal plane of oblong chambers, from each side of which proceeds a vertical growth of compressed columnar ones.

The horizontal plane, which is more or less wavy, is composed of a single layer of oblong, quadrangular, chambers arranged in concentric rows around the germ-cell, which is spherical and may not exceed much its original size or may become very much larger, but always seems to be a little larger than the chambers of the rows which next follow it in development; it is also hardly ever, perhaps never, without a second cell which very nearly embraces it, and this in the section assumes a more or less semi-lunar shape. To the former or germ-cell Dr. Carpenter has, (in *Orbitolites*,) applied the term "central," and to the latter "circum-ambient cell." When the germ or central cell and its accompanying one remain minute, that is not more than the 1-630th of an inch in diameter, the chambers immediately around it are equally so, but increase in magnitude with their distance from the centre; on the other hand, when they are large, the immediately surrounding chambers are proportionately large, but gradually diminish to the usual size, when they also begin to increase slightly again with their distance from the centre, in the normal way. Thus, the structure of the centre may be compact or open, but from the open structure diminishing to a certain degree and then enlarging again, it may be assumed that the former or compact structure, where the chambers undergo an uninterrupted and gradual increase in size from the centre outwards, is the normal form. After a certain distance from the centre, the increase in size appears to cease on account of the maximum size of the chambers

having been attained, when they again begin to decrease in magnitude towards the circumference.

The rows of chambers, whether arising from a minute, or large, central cell and its accompaniment, have a tendency to a cyclical arrangement from the first and very soon complete one. That is, they very nearly surround the central chambers first for a few rows, which tend to keep on one side, and then, at last, embrace it by completing the circle. Formerly, I thought they began multi-spirally, and I gave an illustration of this, ("Annals," v. xi. pl. 7, fig. 26), but latterly I have found out that this illustration was taken from the centre of a minute *Heterostegina* as before stated, and that *Orbitoides dispansa* tends as much if not more to a cyclical arrangement in the centre than any other discoid foraminifer. As the rows extend outwards they bifurcate every now and then, and every now and then one seems to stop altogether, so that this causes an increase and decrease in the number of rows respectively; but the latter is of course less than the former, otherwise there would be no extension of the plane at all. This irregularity therefore, is attended by frequent interruption of the circle, and thus leads to an irregular aspect more or less, of the rows generally, throughout the plane.

The chambers in the normal form, that is where they commence from a minute cell, are small and cubical in the centre, but become elongated horizontally, and compressed vertically, with their distance from it, so that they soon assume a narrow, quadrangular form, which is furthermore altered by becoming convex externally and concave towards the centre, in which direction also, their long axis is at first situated, but as the outermost rows of the full-grown test are reached they undergo the change common to the discoid foraminifera, that is to say, their vertical axis becomes the longest from the diminution of the horizontal one. The chambers also vary greatly in length, and this causes a corresponding irregularity in the rows of which they form a part; thus reducing the row gradually, almost to a mere line, and then expanding it out again to its full size; at other times the chamber becomes doubled, and thus the row appears to bifurcate as just stated; while on other occasions again, the opposite takes place, viz. the chamber ceases to be developed and the adjoining rows closing in, the abortive row thus terminates or ceases to exist. The additional row or bifurcation probably begins in an offset from one of the annular canals which will be presently mentioned, and should be regarded as a "branch," like the branches of the spire in *Nummulites*.

Lastly, the chambers are, for the most part, arranged alternately in adjoining rows, and each communicates by two canals or stolons with

the two immediately in front and behind it, so that every chamber has four others in connexion with it. In this we have an arrangement analogous to the "oblique" canal-system in *Orbitolites Mantelli* which will be described under this head.

Canal-system.—Here and there my horizontal sections present a distinct canal-system, consisting of single annular canals situated between the rows of chambers respectively, connected with each other by straight, smaller branches which pass through the interseptal spaces, so that each chamber is thus enclosed in a quadrangular mesh of canals, and the whole together form a mesh-work plane which is double, that is to say, one exists on each side the horizontal plane of chambers, on a level with the chambers, so as to have the stolon-processes between them. Why the canal-system should only appear here and there in remnants in my sections I am ignorant, unless it be from variation in their size, in imperfect infiltration, or from total absence in parts. Again, from their being analogous to the annular canals of *Orbitolites Mantelli*, which will be described presently, as well as to the great spiral canals of *Operculina* and *Nummulites*, one would expect the proximal ends of the chambers to be united to them, and this is actually the case; that is, the chambers have often a bond of union of this kind when the entirety of the annular canal is not visible, and are as often without it when the annular canal in its entirety and separation is present; while I know of no other structure of the kind in the horizontal plane but this annular canal-system and the stolon-processes; except perhaps, some delicate canals of union between the chambers through the interseptal spaces, too small in my specimens, to be satisfactorily seen.

Vertical growth.—This, on the other hand, is composed of columns of compressed chambers of an irregular shape, which grow out vertically from the layers of the horizontal plane, and beginning from the central cell increase in number, vertically and horizontally, with the extension of the horizontal plane, which thus causes them to be most numerous in the centre, and to assume a convex form which is most prominent at this part. Besides this, the difference in degree of vertical compression, in these cavities, leads to the centre in one specimen being abruptly raised and in another almost flat, viz. where they are inflated and compressed, respectively; added to which the prominence in the centre may also depend more or less on the size of the central and circumambient cells.

With the layers of compressed chambers a number of opaque, white columns consisting merely of condensed shell-substance are developed, which, rising in points situated on the interseptal spaces of the

horizontal plane, gradually increase in thickness vertically, as they radiate also slightly, from their origins, to terminate on the surface.

The compressed chambers of the vertical structure, as before stated, are very irregular in form, and much larger than the chambers of the central plane, from which they are developed partly through the medium of minute vertical tubes extended through the shell-substance of the test, in the same way as in *Operculina* and *Nummulites*; and partly by stolon-processes passing obliquely upwards through the inter-cameral spaces. Thus each compressed chamber is seen to be united to those immediately above and around it by several of these processes; and thus, these cavities assume a columnar arrangement radiating from the central plane; while part of the interspaces between them is filled up by the opaque columns. But the opaque columns as well as the columns of chambers bifurcate, and thus become multiplied to fill up the intervals which would otherwise be caused by their radiation, whereby also the chambers become diminished in size, and thus, on the surface, appear subordinate, in this respect, to the peripheral ends of the columns. So that the convex surface of the fossil presents a number of white points which are the ends of the opaque columns of shell-substance; surrounded by polygonal divisions, which, on their part, are the ends of the columns of the compressed chambers; the interspaces between which again, that is between the chambers, form the radiating, straight stellate lines of connexion between the columns; lastly, across which linear interspaces, the stolon-processes pass that unite the chambers. The stellate lines are frequently not seen, from their transparency, but when opaque and white, give the surface and horizontal section a star-like appearance; their apparent absence, therefore, does not constitute a specific difference. I have never seen any of the stolon-processes passing through the opaque columns, neither have I ever been able to detect a point of yellow ochre in the peripheral extremities of the columns in the infiltrated specimens, indicative of their having been pierced by a vertical canal, although I have had infiltrated specimens in which this must have been the case, had there been one.

Here it is necessary for me to correct an error in my former communication on this subject (Ann. p. 173), viz. where I have stated that the "opaque columns" are "columns of cells." In *Orbitolites Mantelli* there are no opaque columns, as will presently be seen, but there are columns of compressed chambers as in *Orbitoides dispansa*; and the only way in which I can account for my mis-statement is that, the resemblances between *Orbitoides dispansa* and *Orbitolites Mantelli*, on superficial examination, are so great that, I must have been describing

from a specimen of the latter in my hand when I committed this error. The best distinguishing character indeed, between these two fossils, for field-purposes, is the presence of the opaque columns in *Orbitoides dispansa* and their absence in *Orbitolites Mantelli*.

Spherules or propagative agents.—As in *Operculina* and *Nummulites* so in *Orbitoides dispansa*, these bodies are frequently observed throughout the cavities and canals of the test; equally filling the central as well as the peripheral chambers, and equally traversing the vertical tubuli as well as the intercommunicating canals between the chambers, so that in this way they readily find a passage from even the most internal cavities of the organism to the exterior. In their development, judging from the full-grown specimens, the spherules may grow considerably beyond the size which they have at their exit from the parent or very little exceed it, but are almost, if not always, followed by the development of a much larger chamber, viz. the "circumambient" one, as before stated, previous to the development of the rows of small chambers. They vary in size from 1-2000th of an inch downwards.

Orbitoides asterifera, n. sp.—The only difference between this form and that of *O. dispansa* is that it is much smaller; has an asteroid elevation on the surface, consisting of six or eight rays extending from the centre towards the circumference where they bifurcate. The surface-ends of the opaque columns too, are separated from each other by many chambers, while in *O. dispansa* for the most part they are only separated by a ring of single chambers.

Largest size.—Breadth, $\frac{4}{12}$ inch.

Loc.—Valley of Kelat (Dr. Cook).

Associates.—From the same bed of diminutive foraminifera as *N. Kelatensis*, under which see its associates.

Obs.—Excepting the asteroid growth of this fossil, there is nothing but the greater number of chambers which intervene between the peripheral end of the columns to make it differ from *O. dispansa*. Plane, expanded, and asteroid forms exist, indiscriminately mixed together, in the same deposit, but all diminutive like the rest of the foraminifera of which this bed is composed. The rays or ridges are occasioned by the "vertical growth" of the test having been arrested between them.

Note.—On comparing the sectional figures of *O. Prattii* given by Dr. Carpenter (Quart. Jour. Geol. Soc. vol. vi. pl. 8), with *O. dispansa* (*Lycophris dispansus*, Sow.) and *L. ephippium*, I can see no difference whatever between them, and therefore must consider all as *O. dispansa*;

while the asteroid form just described, hardly differs sufficiently from any to deserve a separate specific appellation. Hence, at present, I know but one type of all these *Orbitoides*, viz. *O. dispansa*.

ORBITOLITES MANTELLI, Cart.

"*Orbitolites Mantelli*. H.J.C." (Ann. p. 174).—Of this fossil, d'Arch. et Haime state in their "Table" (p. 363), "est bien l'espèce des Etats-Unis!" viz. that called "*Orbitoides Mantelli*" by d'Orbigny? To this question I have already answered "Yes." It corresponds with the figures of this fossil given by Dr. Carpenter (Quart. Jour. Geol. Soc. *l. c.*); and having obtained specimens of it almost as richly infiltrated with yellow oxide of iron as those of *Orbitoides dispansa*, I will now also describe its structure much more minutely than I have done; equally for the purpose of still further contrasting the differences between these two fossils as for recording the minute anatomy of the fossilized test itself, which the infiltration enables me to do, almost as well as that of *Orbitoides dispansa* :—

The test of *Orbitolites Mantelli* consists of a *horizontal plane* of globular and cylindrical chambers, from each side of which proceeds a *vertical growth*, of columnar ones.

In the *horizontal plane*, everything is the same in respect of waveness, mode of growth around a minute or large central cell and its circumambient chamber, the relative size of the chambers, their arrangement in rows, the bifurcation and effetation of the rows respectively, and their consequent multiplication and disappearance; the incomplete and lateral growth at first, their subsequent entire concentricity, and the plane being only one chamber deep,—as in *Orbitoides dispansa*. But the chambers are quite different in shape from those of *O. dispansa*, different in the direction of their increase in size, and in the arrangement of the canal-system or sarcodal bands which accompany them. They also frequently present an arrangement like that of the interspaces and lines on an engine-turned watch-case at the commencement; and although, I believe they become as much concentric as the rows in *Orbitoides dispansa*, still, out of many successful sections in other respects, I have never been able to trace a row completely round, that is, forming an entire circle; it has always bifurcated or thrown off another row, or become diminished to the annular canal, which could be traced on for some distance, and then disappeared, or began again to bear chambers which could not well be identified with those of the original row.

The chambers in the normal form, that is where they commence from a minute cell, are small and globular in the centre, but become larger and elongated *vertically* with their distance from it, so that they soon assume a cylindrical form, which presents a curve towards the centre and a corresponding convexity in the opposite direction; thus the plane becomes much thicker towards the circumference, indeed is thickest there, although as in all other instances the horizontal diameter of the chambers is diminished. The chambers are also arranged alternately in adjoining rows, and united together by systems of *oblique* and *annular* canals, which were originally filled with sarcode, and to which we will now particularly direct our attention.

The *oblique system* consists of canals or bands which pursue an oblique course from the centre to the circumference like the lines on an engine-turned watch-case, that is, making each a semi-gyration from the centre to the circumference; and as there are two (?) sets of these canals at the commencement, situated respectively in two distinct and separate planes, and the canals of each plane gyrate in opposite directions respectively, so their interstices are quadrangular, and have their angles circularly and radiatingly opposite to each other,—also like the interstices of the figure on the watch-case; while, in the inner angle of each of the spaces is placed the chamber, in contact with the two canals, as they cross each other on different planes at this point. At first there are only two planes of these canals or bands, but, as the chambers become elongated vertically, they may be increased to four and six. The largest infiltrated specimen of *Orbitolites Mantelli* in my possession presents six at the circumference, all of which communicate in the way mentioned with the outer rows of chambers.

The *annular system* on the other hand, consists of two planes only of canals, arranged in concentric circles, which are situated respectively on either side the horizontal plane, on a level with the end of the chambers, with which they are in contact on the inner side, one to each row. Why these canals should not be scalloped or wavy in the infiltrated specimens as they are in the uninfiltrated ones, and in *Orbitolites*, I am ignorant.

In connection with these again there are other indistinct sets of more delicate canals, one of which unites the annular bands transversely, that is passing between the chambers; another unites them vertically; and a third set, which is only seen here and there, proceeds vertically outward between the cells of the *vertical growth* where it appears to be lost. The first set corresponds with the transverse branches between the annular canals in *Orbitoides dispansa*; and to those, which in *Orbitolites*, appear to give origin to the chambers of the following row.

Vertical growth.—This again, in its mode of increase, convexity of the layers of which it is composed, consequent compression and columnar arrangement of the chambers, their being larger than the chambers of the horizontal plane, with which they are in contact, and from which they are developed; the occasional bifurcation of the columns, and the successive development of the compressed cavities of which they are composed being due to minute, vertical, tubular communications which pass through the shell-substance exactly like those observed in *Operculina* and *Nummulites*; together with the lateral stolon-processes traversing obliquely outwards, the inter-cellular spaces, —all, exactly resemble the same parts in *Orbitoides dispansa*. But there is a total absence of the opaque, columnar structure, and the columns of compressed cavities not having this obstruction to their lateral development, are wider at their peripheral ends, while the inter-cameral spaces are consequently smaller than the same parts in *Orbitoides dispansa*. The peripheral ends of the chamber-columns are also more or less circular, and in the little angular spaces between them may be seen the ends of one or more of the *ascending* inter-communicating canals which connect the columnar chambers vertically, and thus complete the line of transit between the centre and surface, besides affording stolons perhaps for the formation of new chambers.

Hence there is a great difference between this fossil and *Orbitoides dispansa*, while no one can help seeing that it is most closely allied to *Orbitolites* in the structure of its horizontal plane (see Dr. Carpenter's sections of *Orbitolites* in Phil. Trans. *l. c.*), any more than one can help seeing that *Orbitoides dispansa*, in the structure of its central plane, is most closely allied to *Cyclocypeus*, Carp.

Alike therefore, as *Orbitoides dispansa* and *Orbitolites Mantelli* may be in other respects, they, in the structure of the central or horizontal plane, are as strikingly different as *Orbitolites* and *Cyclocypeus*.

For field-service, the absence of the white columns and increasing thickness of the horizontal plane towards the circumference, as above stated, at once distinguish *Orbitolites Mantelli* from *Orbitoides dispansa*.

Dr. Carpenter (Phil. Trans, 1856, p. 195, *foot-note*) states that I have fallen into an error which has been corrected by d'Arch. et Haime (p. 349), in placing what M. d'Archiac considered before, as "*Orbitolites*," under the head of *Orbitoides dispansa* and *Orbitoides Fortisi seu Prattii*, with reference, I suppose, to my having changed the name of the fossil first described, from "*Orbitoides Mantelli*" to "*Orbitolites Mantelli*."

I have, however, just stated that *Orbitoides dispansa* and *Orbitoides*

Fortisiseu Prattii are the same, and have *always* done so. That *Orbitoides Mantelli*, d'Orb. is very different, I have also shown, but I question now that Dr. Carpenter has so clearly defined *Orbitolites*, whether *Orbitoides Mantelli* ought to retain the name under which I have described it, any more than *Orbitoides dispansa* should be called "*Cyclocypeus dispansus*." It had better even have retained the old name of *Orbitoides Mantelli*, d'Orb., I think. But it must be plain now, that if *Orbitoides dispansa* is to be considered the type of the genus, our *Orbitoides Mantelli*, d'Orb., is not of this type, and therefore, should still have another name. It has already had three, viz., 1st, *Nummulites Mantelli*, d'Orb., 2nd, *Orbitoides Mantelli*, d'Orb., and 3rd, *Orbitolites Mantelli*, Cart.

Propagative spherules.—I have observed these bodies in some of the cells of the infiltrated specimens of *Orbitolites Mantelli*, but they are not numerous; and it is only here and there that I have been able to observe them in the specimens of *Nummulites sublævigata* with which they are imbedded; while the imperfect infiltration of the whole, compared with the specimens of *Orbitoides dispansa*, &c. from Wasna, in which these "spherules" abound, seems to indicate that the former were imbedded long after death, while the latter must have been imbedded almost alive.

"2. *Orbitolites* ——— ?" (Ann. p. 175, pl. vii. figs. 40, 41).—The specimen thus noted and alluded to by d'Arch. et Haime (p. 350), as being perhaps *Orbitoides Fortisi*, is the fossil from which I have made out the structure above given, the only difference between it and *Orbitolites Mantelli* being that the columns of cells terminate at the convex part or periphery in polygonal instead of circular cells; a difference which is hardly enough to make it more than a variety, as the cells are anything but circular in the assumed typical form.

Associates of Orbitolites Mantelli.—*Heterostegina* and *Cyclocypeus*, in white limestone at the village of Takah on the S. E. coast of Arabia. *Nummulites sublævigata* in yellow, argillaceous limestone in Sind. (This is the specimen to which I have just alluded as being but a variety of *Orbitolites Mantelli*, and from which the structural description above given was taken. It is imbedded with the richly infiltrated mass of nummulites, from which the diagram of nummulitic structure given in the Plate accompanying my description of the structure of *Operculina Arabica*, was compiled.)

Obs.—I have never found *Orbitolites Mantelli* with any other

nummulite than *N. sublævigata*, and this only in the specimen above mentioned from Sind, although it is very common in Sind.

Like *Orbitoides dispansa*, it is sometimes small and prominent in the centre; at others more or less flat, twisted, and expanded, like the ephippial varieties of *O. dispansa*. The latter, from the wavy, fragmentary state in which it occurs in the matrix, led me into the conjectural error of stating that it sometimes seems to spread itself out in a thalloid form, like the Polyzon, whereas, subsequent examination tends to the conclusion that it always assumed a discoid form, although much more expanded and thinner in some instances than in others.

If, as I have before inferred, viz. that *N. sublævigata* be the oldest form of nummulites, from its being confined to the lowest deposits of the Nummulitic Series, be correct, then this may be the locality and age of *Orbitolites Mantelli*; but if, as subsequently stated, this be a middle tertiary series, then *O. Mantelli* and *N. sublævigata* would belong to the youngest or latest formed species of larger Foraminifera; which I now think most likely, as the bed of *Orbitolites Mantelli*, *Heterostegina* and *Cycloclypeus*, together with that containing the reticulated nummulite, *N. Masiraensis* in the island of Masira, on the S. E. coast of Arabia, and that containing *N. sublævigata* at Muskat, would then all be in the littoral division of the nummulitic series of this part of the coast of Arabia; the other or lower division forming the summits of the great scarps a little more inland.

CONULITES, *nov. gen.*

Conulites Cooki, n. sp.—Conical, discoidal, more or less depressed, consisting of a cortical layer of rhomboidal chambers, filled with a columnar structure which slightly projects in a convex form beyond the base. Cortical layer composed of a spire of chambers commencing from the apex and terminating at the circumference of the base; septal lines of the chambers oblique; chambers rounded internally. Columnar structure radiated, consisting of convex layers of compressed chambers which are more or less arranged in columns, united by stolon-processes, and interspersed with opaque white columnus. Opaque columns conical, growing from points on the inner aspects of the chambers and terminating in dilated extremities at the base, which thus acquires, when weather-worn, a granular surface. Apex surrounded externally by a thin, columnar growth of shell-substance which extends about half way up the side of the cone, and there gradually subsides into small, granular projections situated on the points of contact between the septa and the spire.

Largest size.—Breadth at base, $\frac{5}{12}$ inch; height of cone, $\frac{2\frac{1}{2}}{12}$ inch.

Loc.—Sind, locality unknown. Valley of Kelat (Dr. Cook).

Associates.—*N. exponens* (var. *b*). *Assilina obesa*. *N. perforata*. *N. Biaritzensis*. *N. spira*. *Alveolina elliptica* and *Orbitoides dispansa* in the Valley of Kelat. *N. Carteri* and *N. spira* in Sind.

Obs.—I first recognised this fossil amongst some nummulites sent from Kelat by Dr. Cook, and then in the mass in some specimens from Sind previously in my possession.

The spire is generally single throughout, but sometimes bifurcated, so as to become double; and the same with the septal lines, which have a radiating, spiral tendency from the apex towards the circumference; while the columnar structure, in respect of the chambers and columns, is almost identical with that of *Orbitoides dispansa*. As yet, I have met with no specimen sufficiently infiltrated with yellow oxide of iron to follow out the internal structure minutely. This fossil is very like the conical forms of *Orbitolina*, but differs in the cortical layer consisting of a spire, instead of concentric rings, of chambers; and in the columnar structure being accompanied by the white opaque columnus. Thus *Conulites* belongs to the "Hélicostègues" of d'Orbigny.

ORBITOLINA, d'Orb.

1.—*Orbitolina lenticularis*, Lam.—Conical, obtuse, slightly excavated or patulous, margin everted, external surface presenting concentric rings; patulous surface presenting granulations which are more or less confused in the centre but arranged in radiating lines towards the circumference.

Size.—Breadth, $\frac{2}{12}$ inch; height, $\frac{1}{20}$ inch.

Variety, *a*.—Conical, acute, deeply excavated.

Size.—Breadth, $\frac{1}{8}$ inch; height, $\frac{1}{20}$ inch.

Variety, *b*.—Flat, circular, wavy, thick; thinning towards the circumference.

Size.—Breadth, $\frac{2}{12}$ inch; height, $\frac{1}{32}$ inch.

Variety, *c*.—Discoidal, almost flat, very thin, papyraceous.

Size.—Breadth, $\frac{8}{12}$ inch; thickness $\frac{1}{48}$.

Loc.—All from the south-east coast of Arabia, at Ras Fartak, with fossils of the Cretacean Age.

Obs.—These foraminifera I first described under the name of "*Orbitolites*" in my Memoir on the Geology of the S. E. Coast of Arabia,

(Jour. By. Asiat. Soc. v. iv. p. 71); and then again under that of "*Orbitolina patula*" (Geol. Pap. Western India, pp. 549 and 603). Since which, I find that the species, when compared with Pictet's figure (Traité de Paléontologie, pl. 109, fig. 7), is distinctly that of the "perte de Rhone," viz. *Orbitolina lenticularis*, Lam. under which name it is now given, and I cannot help thinking, with Messrs. Parker and Jones (Ann. v. vi. p. 36, 1860), that, d'Orbigny's *Cyclolina* must be intended for the flat and expanded variety of this fossil. Perhaps, also, his figures of it were taken, by mistake, from *Orbitolites*; but of this more hereafter.

These fossils abound to such an extent at the place mentioned that a bed of stratified blue limestone, upwards of 100 feet in thickness, is almost entirely composed of them, while the presence of Ammonites and cretaceous fossils in the superincumbent strata, also more or less richly charged with *Orbitolina*, proves the whole to be of Cretaceous Age.

Structure of Orbitolina lenticularis.—This fossil, like *Conulites Cooki*, is composed of a cortical layer of chambers externally, which is more or less conical in shape and more or less filled internally, with a columnar chamber-structure. The cortical layer here, however, is composed of concentric rings of chambers which begin in a central cell at the apex, and terminate at the circumference of the base. Each annulus is divided into a number of chambers with straight septa, faced superficially, by a reticular, sub-septal structure which extends into the chambers a certain distance, but not throughout, so that, when this facing or superficial reticulation is removed by acid, the larger divisions beneath come into view.

The columnar structure again, as in *Conulites*, is composed of layers of compressed cells which more or less fill the cone, according to the species, and sometimes extend even beyond the base so as to give this a convex surface. But there are no opaque, white columns here as in *Conulites*, and the granulations on the patulous surface and convexity of the base respectively, represent the ends of the columns of cells as in *Orbitolites Mantelli*. While therefore, *Conulites* is most like *Orbitoides dispansa*, *Orbitolina* more resembles *Orbitolites Mantelli*; but *Conulites* still differs from both, in the great chamber-layer being helical instead of cyclical, as before stated.

2. *Orbitolina* ———?—Conical, base convex, annular spaces wider and more reticulated than in the foregoing species. Internal structure the same as that of *O. lenticularis*.

Largest size.—Height, $\frac{9}{12}$ inch; breadth at the base, a little more.
Loc.—Valley of Kelat (Dr. Cook).

Associates.—*Alveolina elliptica* in white limestone. The diminutive Foraminifera, in the bed before mentioned. Valley of Kelat (Dr. Cook.)

3. *Orbitolina* ——— ?—The same as the foregoing but with no reticulation on the surface, and the septa indistinctly developed.

Largest size.—Height $\frac{7}{48}$ inch; breadth at the base about the same.

Loc.—Buran River in Sind, in limestone charged with *Orbitolites pedunculata*, Cart.

Associate.—*Orbitolites pedunculata*.

4. *Orbitolina* ——— ?—Of the same shape as the last, but the cortical layer consisting of long chambers twisting round the cone, and interdigitating with each other, at their commencement and termination.

Largest size.—Height $\frac{6}{48}$ inch.

Loc.—S. E. coast of Arabia, close to Ras Sajar, in white limestone richly charged with *Orbitolites*.

Associate.—*Orbitolites*.

HETEROSTEGINA, d'Orb.

Heterostegina pleurocentralis, n. sp. (?)—Elliptical, thin, flat, wavy. Surfaces presenting a corresponding prominence on each side, situated laterally and towards one end of the ellipse; covered with minute tubercles which, becoming larger eccentrically, pass off into moniliform rows, that, after a sub-spiral course terminate on the margin. Internally consisting, except at the prominence, of a single plane of oblong chambers filling up the intervals between the rows of tubercles with their long axes horizontal and across their sub-spiral course. Margin, inflated, round, smooth.

Largest size.—Longest diameter, $\frac{3}{8}$ inch.

Loc.—Village of Takah on the S. E. coast of Arabia, in white limestone.

Associates.—*Cycloclypeus* and *Orbitolites Mantelli*.

Obs.—This and *Orbitolites Mantelli* are very numerous together in the white limestone at the place mentioned. Although smaller, it differs so little from the species found at Malta that I think they should be regarded as the same.

Note.—Misled by the figure of Lamarck's *Orbiculina adunca* (Encyclop. Méthod. Tab. 468), I called this fossil "*Orbiculina pleurocentralis*," (Geol. Pap. West. India), but on receiving Dr. Carpenter's kind present of a copy of his second valuable "Memoir" on the Foraminifera, (Phil. Trans. p. 547,—1856), I saw my mistake, and made the necessary correction (Jour. Bomb. Asiat. Soc. v. v., p. 634).

I have designated this foraminifer "*pleurocentralis*" here, because I had given this name to it formerly; but having since obtained some of the fossil *Heterostegina* from Malta, I find the resemblance between the two so close, that I hardly think that it should be considered otherwise than a variety of the latter. It hardly differs more, (that is the specimens in my possession,) than in being a little smaller than the *Heterostegina* of Malta.

The resemblance of the horizontal face of this fossil to *Orbitoides dispansa* seu *Pruttii* while in the matrix, led me to think that it was this foraminifer, an error in both editions of my Memoir on the Geology of the S.E. coast of Arabia (*loc. cit.*), which I thus take the opportunity of correcting. As before stated, I did not meet with *Orbitoides dispansa* in Arabia, nor have I ever found *Orbitoides dispansa* together with *Orbitoides Mantelli*; and as I have also before stated, it was the mistaking of the small specimens of this *Heterostegina* among those of *Orbitolites Mantelli*, for *Orbitoides dispansa*, which led to my giving a section of *Heterostegina* as illustrative of the "multispiral" commencement of the chambers in the latter.

CYCLOCYPEUS, Carp.

Cyclocypeus mammillatus, n. sp.—Circular, thin, presenting a prominence in the centre surmounted by a large tubercle which is again surrounded by a number of minute ones, the latter passing off in broken lines to terminate in a radiating, spiral manner upon the margin. Margin thin, not inflated. Chambers circular in the centre, becoming oblong and quadrangular towards the circumference, arranged in rows, with their long axis in the direction of the horizontal or long radius of the fossil.

Largest size.—I could only obtain one specimen entire, which was $\frac{1}{2}$ inch in diameter.

Loc.—Takah on the S. E. coast of Arabia, in white limestone with *Orbitolites Mantelli* and *Heterostegina*.

Obs.—Here the minute granulations instead of being on the lines separating the rows are over the septal divisions between the chambers

themselves. Thinking, from my limited means of examination, and from its being associated with *Heterostegina*, that this fossil must be considered one of the same genus, I gave it the above specific designation, but having lately cut away a little of its surface to examine its internal structure I find that it is distinctly a *Cycloclypeus*.

The cells of this specimen diminish in size towards the centre and become almost globular; but this may be, because the central cell happened to be minute instead of large. In Dr. Carpenter's typical form however, the cells are deeper in the centre and become shallower outwards, and if this be always the case, then *C. mammillatus* follows what I have considered to be the normal form of the horizontal planes in *Orbitoides dispansa* and *Orbitoides Mantelli*, especially when commencing with a minute cell; rather than typical *Cycloclypeus*, which, contrary to all the other foraminifera, appears to *begin* in the centre with large chambers, which go on decreasing in size outwards, without first going down to the smaller size of their situation, and then increasing again towards the circumference. But for this, and the chambers exchanging their quadrangular for a globular form towards the centre, together with the smallness of the fossil, there is no difference that I can see between the fossil *Cycloclypeus* of the S. E. coast of Arabia and the recent one described by Dr. Carpenter (Phil. Trans. pl. xxx. fig. 1).

ORBICULINA, d'Orb.

Orbiculina Malabarica, Cart.—This fossil, which I had described under the name of "*Orbitolites Malabarica*," (Ann. v. II. p. 425, 1855,) I found afterwards to be an *Orbiculina*, from its resemblance to *Orbiculina angulata*, Lam. (Encyl. Méthod. t. iii. pl. 468, fig. 3), and I therefore made this correction in the vth vol. of the Journal of the Bombay Asiatic Society, p. 634; immediately after which, that is to say before the sheet had passed through the press in which my correction was printed, I had the pleasure to receive, through Dr. Carpenter's kindness, his second "Memoir" on the Foraminifera, in which I found that he had also made the same correction. I mention this chiefly to point out the great resemblance between the figure in the *Encyclop. Méthod.* to which I have alluded, and *Orbiculina Malabarica*. For a description and illustration of the fossil itself, see "Ann." *loc. cit.*

Variety *a*.

Largest size.—Breadth $\frac{1}{2}$ inch.

Loc.—Khattyawar, on the coast near Poorbunder, in yellow compact limestone, Capt. Constable, H.M.I.N.

Associates.—Fossils of the Middle Tertiary Epoch like those accompanying *O. Malabarica*, (typical form).

Obs.—The only differences between this fossil and the typical form are, that the chambers are much smaller in the specimens from Khatyawar; the structure appears to be finer, and from being in a purer, more compact, and fawn-coloured limestone, which is densely charged with them, they appear from their light colour and fine structure identical with *Orbitolites complanata*; but the distinct spiral arrangement in the centre, which is very evident under even a strong magnifying lens, establishes the difference directly.

ORBITOLITES, Lam.

Cyclolina pedunculata, Cart. (Ann. p. 176.)—Since I have had the advantage of Dr. Carpenter's clear and valuable exposition of the structure of *Orbitolites* (Phil. Trans. 1855), there is no longer any doubt of my false identification of this fossil with d'Orbigny's *Cyclolina*, nor of the true one being with *Orbitolites*; and therefore, if it be really a new species, which I also doubt very much, it might now go by the name of "*Orbitolites pedunculata*." I expect, after all, it will be found to differ very little from *Orbitolites complanata* of the "Paris Basin."

Associates.—*Alveolina elliptica*, and a small nummulite belonging to the "Striatæ," on the Buran River in Lower Sind; and on the same river with the *Orbitolina* beforementioned, "No. 3." With *Alveolina sphaeroidea* and *Operculina* in the white limestone forming the summits of the great cliff-scarps behind Morebat; and also with *Orbitolina*, "No. 4" *antè*, in broken masses under the great promontory of Ras Sajar, on the S. E. coast of Arabia.

Internal structure of Orbitolites pedunculata.—This is the same as that given by Dr. Carpenter in his vertical sections 8 and 9, pl. vi., and in his horizontal surface-view, fig. 8, pl. vii. The chambers in the centre have not run into each other vertically, as shown in Dr. Carpenter's "ideal representation," fig. 6, pl. v., neither are the chambers of the surface oblong but globular, while in the centre the rows are frequently oval instead of circular. Both these differences, however, as Dr. Carpenter observes, are worth no more than marks of variety.

The peduncle at the base in the centre is composed of amorphous shell-substance, through which a number of branched transparent lines extend upwards into the centre of the disk, indicative of their once having been canals, perhaps occupied by sarcodæ. Dr. Carpenter.

observes, that the fossil was probably attached during its lifetime to some marine body, and therefore the peduncle here may be of very little specific value; thus reducing the species to *Orbitolites complanata*.

"*Cyclolina Arabica*, Cart." (Geol. Pap. Western India, p. 550).—This, if it be a new species, should have its name changed to "*Orbitolites Arabica*." The only difference between it and the Sind orbitolite, is its larger size and finer structure, which are by themselves worth nothing as specific distinctions; hence, perhaps, this also had better be considered as a variety of *O. complanata*.

Associates.—They have been given above under *C. pedunculata*.

Note.—Feeling satisfied now that these fossils are *Orbitolites*, and not *Cyclolina*, d'Orb., and that I have not found "*Orbitolites*" in the Cretaceous Strata of the South-East coast of Arabia, I have first to correct my errors in nomenclature to accord with this conclusion, which has been done above; and next my inferences, which were based on the assumption that this *Orbitolites* was identical with d'Orbigny's *Cyclolina*.

My inference (Geol. Pap. W. I., p. 627,) that the white limestone forming the summit of the great cliff-scarps on the S. E. coast of Arabia was of Cretaceous Age, because it contained a discoid fossil identical in appearance with *Cyclolina cretacea*, d'Orb. (this fossil, according to d'Orbigny, being confined to the Cretaceous Period), is perceived to be wrong, since it is now proved to be *Orbitolites*, which brings back the summit-portion of these scarps to Eocene Age, as assumed in the first edition of my "Memoir" on the Geology of this coast (Jour. Bomb. Asiat. Soc. v. iv., p. 95), wherein the fossil itself was also first called "*Orbitolites*."

Again, at p. 701, foot-note, the mistaking of this *Orbitolites* for *Cyclolina* has led to a similar error;—for, finding the Sind orbitolite associated with fossils of the Eocene Period in that country, and considering it also a *Cyclolina*, I inferred that d'Orbigny himself was wrong in restricting the existence of this fossil to the Cretaceous Period; whereas, now that it is known to be an orbitolite, the inference is in the opposite direction, and in support of d'Orbigny's assertion.

What then is d'Orbigny's *Cyclolina*? A question which may be first met by stating, that "had d'Orbigny made plain what *Cyclolina* is, there would have been no occasion for such a question."

From what Dr. Carpenter has stated, it is evident that he was inclined to view *Cyclolina* as a species of *Orbitolites*, (1st Mem. p. 226, pl. vii., fig. 14); while Messrs. Parker and Jones, (Ann. v. vi, p. 36—

1860), consider it an "excessively out-spread" form of *Orbitolina*, "judging from d'Orbigny's description and figures," in his *Foram. Foss. de Vien.* p. 139, pl. xxi, figs. 22—25.

In the latter view I acquiesce now, and even applied the name of "*Cyclolina*" to one of these out-spread forms of *Orbitolina* which I found in the great deposit of *Orbitolinæ* on the S. E. coast of Arabia (*Geol. Pap. W. I.*, p. 549), from its resemblance to d'Orbigny's figures, but wrongly identified it with the "discoid fossil," of the scarp 2,000 feet above, now seen to be *Orbitolites*;—the former in company with Cretacean, and the latter among a type of Eocene fossils.

All this confusion has arisen from the imperfect way in which d'Orbigny has described and figured his *Cyclolina cretacea*. It would have been better if he had never written anything about it, than just enough to mislead.

He states that it is "æquilateral." This is a character of *Orbitolites* and not of *Orbitolina*. That the chambers are concentric, "making each a complete circle round the others of the same form;" by which I understand him to mean an *annular* chamber without septa, in fact a hollow ring. But so far as my observation goes, the concentric ring-spaces of *Orbitolina*, if not divided up into chambers like those of *O. lenticularis*, should interdigitate with each other as in *Patellina corrugata* (*Ray Soc. Pub.*, Monograph by Prof. Williamson, p. 46, pl. 3, figs. 86-89). This annular form however, according to d'Orbigny, is the peculiar characteristic of his *Cyclolina*, viz. "circular chambers."

Again, as regards d'Orbigny's figures (*loc. cit.*), nothing can be more like the expanded, flattened disk of *Orbitolina lenticularis* than his horizontal view of *Cyclolina* (fig. 22). It has also, according to the shading, an elevated centre, but which does not appear in the lateral view (fig. 23). Again, if it were like *Orbitolina lenticularis*, the margin should be rounded and thin, for that of the latter fossil is thin and everted; instead of which it is flat, and, if anything, thickened, for it obscures the rest of the fossil when viewed edgewise,—if d'Orbigny's figure 23 be correct. If equilateral, it should have the same annular markings on *each* side. How then can it be an "excessively outspread" form of *Orbitolina annularis*, as assumed by Messrs. Parker and Jones? It is needless to conjecture further, for until the fossil is better illustrated and more satisfactorily described, we shall never know what it is. The peculiarity of "annular chambers" and the discrepancy in d'Orbigny's figs. 22 and 23, where the former represents an elevated centre and the latter does not show it edgewise, while there is nothing in the short, meagre description accompanying it to

show that the disk was excavated, renders the record almost worse than useless, and shows that, when anything is described, it should be done so satisfactorily, or a statement made to the effect that the data were not sufficient for this purpose.

Résumé.

From the foregoing observations on structure then, we may sum up the description of the discoidal Foraminifera in the following way :—

Test.—The test is situated in the substance of the animal, and in *Operculina* consists of the spiral or horizontal lamina and the marginal cord. The spiral lamina again is divided into the parts which cover the chambers and those which cover the interseptal spaces. The former is pierced with close-set, vertical tubuli, and the latter, with more or less scattered, minute branches of the interseptal canals. Besides this, there are non-tubular spaces or puncta, more or less regularly scattered over the chambers and interseptal spaces, which answer to the external ends or bases of the conical columns of condensed shell-substance, intended apparently for strengthening the test, and these are accompanied in some species of *Nummulites*, by a horizontal branch-work of the same material, which gives them very much the appearance of the lacunæ and their canaliculi in bone, yet they present no appearance of channelling, but on the contrary, a heterogeneous composition, as regards size, of small pillars and pellets of condensed shell-substance, respectively. The marginal cord on the other hand, is composed of spicules, an inter-spicular substance, and canals, which are all more or less arranged in layers radiating from the centre of the base of the cord, which is straight, to its circumference, which is semi-circular. The spicules overlap each other longitudinally, and the canals form a densely reticulated structure throughout the substance of the cord whose branches open in all directions upon its surface. As the test arrives at its full growth, the marginal cord is bent down over the last chamber to meet its preceding turn, to which it becomes attached, and the *Operculina* thus hermetically sealed. Hence d'Orbigny's original statement, that the test is without an opening like that of the *Nautilus* and *Ammonites*, and, without a siphon.

Canal-system.—The canal system consists of,—1st, two great spiral canals, one in each horizontal half of the test, which run from its commencement to its termination, and are situated respectively on each side the marginal cord, at its point of junction *externally*, with the spiral

lamina, in which line also it opens externally by a few ramusculi, like the interseptal canals. 2nd, the interseptal canals, two in each interseptal space, which arise respectively from the great spiral canals of the preceding turn, and terminate on the *inner* aspect of the cord close to the chamber where they divide into branches which join the marginal plexus, the great spiral canals, and open externally on the surface of the cord, respectively. 3rd, The marginal plexus, which occupies the marginal cord, and is formed of an intricate net-work of canals derived chiefly from branches of the great spiral and interseptal canals, which net-work is spread throughout the cord, and, as before stated, opens in all directions over its surface. 4th, A system of small canals, which open on the surface along the lines of the great spiral canals and interseptal spaces, and are in connection with the spiral and interseptal canals respectively.

Animal.—This, as was discovered by Dujardin, is a Rhizopod, which fills more or less all the chambers and canals of the test, besides spreading over its surface externally, hence M. A. D. d'Orbigny was not far wrong, when he stated, or M. de Férussac did for him (Ann. des Sc. Nat. t. vii. p. 100, 1826), “que le test de ces petites coquilles était entièrement renfermé dans le corps,” though he was wrong for the time in taking the rhizopodous extensions for the arms of a cephalopod, as he subsequently admitted. The chambers consist of cavities of this sarcode which are more or less filled with propagative spherules, &c., which will be more particularly mentioned directly; and they communicate by short branches with the great spiral and interseptal canals, the marginal plexus, and with each other through the interseptal spaces, besides opening on the surface, through the vertical tubuli.

The sarcode of the canal-system is also more or less tubular, and thus affords a transit for the contents of the chambers externally; probably however not “tubular,” as the word is generally understood, but sarcodal, *through* which the substances are transmitted as in *Amœba*.

Besides the propagative spherules, the chambers contain starch in grains and amorphous, which still more nearly allies the Foraminifera to *Spongilla* and probably all the sponges, for as starch abounds in the former it may be assumed to be present also in the latter. Whether the chambers contain any other than the propagative organs, remains for future research to determine. They not improbably each, also, contain a *nucleus*.

As regards nutriment, this may be enclosed by the sarcode and a stomachal cavity extemporized for digestion, at any part, while the

injesta may be ejected through the sarcoode direct or through the larger tubes of the canal-system. Lastly the smaller canals, which open over the great spiral canals and interseptal spaces, may be for admitting water into the larger ones, and thus afford a water-circulation.

Propagative spherules.—These are produced in the chambers, and are of two kinds, viz. large and small.

The small spherule is composed of a homogeneous sphere of matter (slightly tinged yellow by iodine) which is enclosed in a delicate, transparent, spherical capsule, and attached in massive groups to branched stems like grapes, while the large spherule consists of a sphere of granular substance equally tinged yellow by iodine, and sometimes also surrounded by a transparent, delicate, spherical cell. The former are about 1-5400th and the latter 1-1800th inch in diameter. The chambers may be more or less filled with both kind of spherules together or separately, and the smaller may be the earlier stage of the larger, if they be not sperm-cells; while they may be also observed on their transit to the exterior, in all parts of the canal-system even to the vertical tubuli, where their elongation in the fossil species (*Nummulites*) at once points out their softness and adaptation in this respect to the sizes of the canal through which they may have to pass; but from being of different sizes below the largest abovementioned, they, for the most part, take the largest or smallest tubes for outlets according to their size. This variation in size may also account for the variation in size of the primary cell of the full-grown species; which is sometimes as small nearly as the smallest spherule, and at others much larger than the largest. Those which are observed about the test externally are white when dry, so that they already contain calcareous matter. Sometimes the spherule or primary cell begins to develop a second while still in the parent chamber (I have seen this in the outer turn of *Nummulites*, indeed I have the section showing it), and then the young one evidently becomes too large for passage through the ordinary channels. In this case it would seem that a special opening is formed for their exit through the spiral lamina, for holes exist here and there in this part of the test, which, from their rounded edge, indicate that they were made by the animal. Not unfrequently these are formed opposite the great spiral canals.

Mode of development.—The spherule having left the parent becomes the primary cell of the new being, and putting forth a stolon, produces another chamber, and so on until a certain number are formed which are arranged horizontally around the first, and the *Operculina* developed.

The stolon, therefore, forms part of the canal-system, and the chambers are in this manner developed from it. As development progresses, the chambers which bud from the *margin* of the cord, attain their largest size, and then begin to diminish again, until they end in nothing almost, which is closed in, as before stated, by the bending down of the marginal cord and its union with the preceding turn, when the test is thus hermetically sealed and its form completed. The union between the chambers at their bases is probably filamentous, for the chambers do not *here* communicate with each other, while the calcareous septa which divide them are frequently united to the marginal cord, and if not in direct contact, they are always more or less scolloped, indicating a filamentous layer of the sarcode which previously existed between them and the cord; besides, we shall see presently that the development of the test is frequently continued on without the presence of the chambers, so there can be no question that all other structures are developed from the sarcode of the canal-system, or from the filamentous sarcode, connected of course originally with a nucleated cell, the germ-cell. Hence the filamentous sarcode becomes analogous to the mycelium of Fungi, and being rhizopodous, is united, through the Sponges, to the fungal parasitic animals which inhabit the cells of Algæ, and are propagated by monociliated *Amœbæ*; and through the latter, to the true Fungi, which are propagated by defined sporules.

Nummulites is nothing but a more complicated form of *Operculina* type. The chambers bud from the margin of the cord and extend outwards and inwards until they reach the level of the margin of the last turn and the umbilicus of the test respectively; the last three, four, or more, being of successive sizes, up to the last of all, which is least developed.

The same principle obtains in the formation of the test and propagation of *Orbitoides dispansa* and *Orbitolites Mantelli*, Cart. (*Orbitoides Mantelli*, d'Orb.); but the canal-system is different, and there are no columns of condensed shell-substance in the latter. In *Orbitoides dispansa* each chamber is united to the two in front and the two behind it by stolon-processes as in *Cycloclypeus*, Carp., and there is an annular canal behind each row which is united by straight, transverse, interseptal or intercameral branches with that in front and behind it, in each half of the test.

The latter system also exists in *Orbitolites Mantelli*, but the stolon-processes are represented by oblique canals which gyrate from the centre to the circumference, and thus unite each chamber with the two in front and two behind it; while as the chamber becomes elongated

towards the circumference, the oblique canals are increased to 2, 4, and 6, in number in the outer rows, one above another, so as to resemble their disposition in *Orbitolites*, as shown in Dr. Carpenter's diagram. In the annular canals we cannot help seeing the analogues of the great spiral canals in *Operculina* and *Nummulites Ramondi*, &c., if not in all nummulites; while in the stolon-processes of *Orbitoides dispansa* and the oblique canals of *Orbitolites Mantelli*, we seem to have a combination of the marginal plexus and interseptal canals, for they both open ultimately at the margin or circumference of the tests respectively. The columnar chamber-structure on the other hand in both, which corresponds with the vertical development of nummulites, that is the extension of the chambers to the umbilicus on each side the horizontal plane, is united by ascending and horizontal stolon-processes which indirectly give exit to the propagative spherules, throughout; for the same kind of spherules are developed in both the chambers of the horizontal plane and those of the columnar structure, even to the very centre of these fossils, as in *Nummulites* and *Operculina*.

The tests of *Conulites* and *Orbitolina lenticularis*, are developed upon the same principle as the rest, and both present the same kind of propagative spherules in their chambers. *Conulites* however, has the same columnar chamber-structure and columns of opaque shell-substance as *Orbitoides dispansa*, but with a *helical* layer of chambers externally something like the horizontal layer of *Nummulites*; while *Orbitolina lenticularis* has no columns of opaque matter in its columnar chamber-structure, and has a *cyclical* arrangement of the rows of chambers externally, like that of the horizontal plane in *Orbitoides dispansa* and *Orbitolites Mantelli*, and the rows in *Orbitolites complanata*.

Alveolina meandrina, and therefore, *A. elliptica*, are developed upon the same principle as nummulites would be if elongated vertically. The former has an interseptal system and marginal plexus of canals and the latter too, probably. In *Alveolina elliptica* the greater part of the test is often without chambers, so that its development is as often wholly carried on by the sarcode of the canal-system, and the same is frequently the case with the last turns of the globose forms of nummulites, e. g. *N. perforata*; while in *Alveolina elliptica* also, the chambers sometimes disappear and reappear at intervals, leaving the spire to go round by itself in the meanwhile; as exemplified also, in the annular canals of *Orbitoides dispansa* and *Orbitolites Mantelli*. These are the instances to which I have before alluded as evidencing a development of the chambers upon the sarcodal filaments of the canals.

ART. V.—*Short Memorial of the Honorable Mountstuart Elphinstone, and of his Contributions to Oriental Geography and History.* By JOHN WILSON, D.D., F.R.S., Honorary President of the Society.

Read on the 9th May 1860.

It is not the object of this short paper to present to the Society a regular biographical sketch, however short, of the distinguished individual to whom it refers. Its aim is merely that of expressing our obligations to his valued patronage, and to his own literary efforts for the illustration of Indian Geography and History. It is principally for the sake of order that the date of a few of the more prominent incidents of his life is here given.

Mountstuart Elphinstone was the fourth son of the eleventh Baron Elphinstone, by Anne, daughter of the third Lord Ruthven. He was born in 1779, and was educated partly by a private tutor in his own family, partly at the High School of Edinburgh, and partly at a private school near Kensington. In his early days he was more distinguished for his animation and activity than for that eager and diligent application to study which he exhibited in after-life. He left England for India in July 1795. His first appointment in this country was that of Assistant to the Magistrate of Benares. After being about four years in that office he was transferred to the Political Department of the Public Service, of which he was destined to reap the highest honours. By Lord Wellesley, by whom he was early appreciated, he was appointed, in 1801, Assistant to the Resident at Puná, Colonel Barry Close, an able military and diplomatic servant of Government. He was present, with his superior officer, at the negotiation of the treaty of Bassein in 1802, and he was soon called upon to witness important military proceedings to which, in defence of the Peshwa from the rival Maráthá powers, that treaty gave origin. In August 1803 he became Secretary to Sir Arthur Wellesley at Ahmadnagar: and with that prince of warriors he was in the thick of the battle of Asáyi and other engagements which followed. By Sir A. Wellesley, who formed a high opinion of his talents and sagacity, he was recommended to the charge of the

Residency at Nágpur, which he assumed at the early age of twenty-five. His appointment to the embassy to Cabul, which I shall immediately notice in connexion with the publication of his work on that country, took place in 1808. His journey to Pesháwar occupied him for about twelve months; and his preparation of the Reports connected with that journey another year.

Towards the end of 1810, Mr. Elphinstone was nominated to the Residency at the Court of His Highness the Peshwa. He left Calcutta to proceed to Bombay in the Ship *Ahmoody*, Captain Kinsay, on the 7th January 1811. Among his fellow-passengers was the Rev. Henry Martyn, the celebrated chaplain, and translator of the New Testament into Hindustání and Persian, who, writing of him in his Journal, says, "His agreeable manners and classical acquirements made me think myself fortunate indeed in having such a companion, and I found his company the most agreeable part of my voyage." On the 24th of the following February, the party arrived in Bombay, from which Mr. Elphinstone soon proceeded to take up his appointment at Puná, which was the more important that the Maráthá powers were really then in an unsettled and restless state, though but few visible symptoms of their disaffection to the British Government were apparent.

Mr. Elphinstone was admitted into this Society, then known by its original designation of the BOMBAY LITERARY SOCIETY, on the 24th February 1812. He was proposed as a member by Major General John Malcolm, seconded by Mr. William Erskine. The party at Bombay with whom he had most genial sympathy was Sir James Mackintosh.

Mr. Elphinstone's literary leisure at Puná was, in the first instance at least, devoted to the final preparation for the press of his important work entitled, "An Account of the Kingdom of Cabul, and its Dependencies in Persia, Tartary, and India, comprising a View of the Afghan Nation, and a History of the Douranee Monarchy." Of this admirable production, in two volumes, three editions have appeared,—in 1815, 1838, and 1842.

The origin of the work is thus explained by Mr. Elphinstone himself: "In the year 1808, when, from the embassy of General Gardanne to Persia, and other circumstances, it appeared as if the French intended to carry the war into Asia, it was thought expedient by the British Government in India to send a mission to the King of Cabul, and I was ordered on that duty. As the court of Cabul was known to be haughty, and supposed to entertain a mean opinion of the European nations, it was determined that the mission should be in a style of great munificence, and suitable preparations were made at Delhi for its

equipment. An excellent selection was made of officers to accompany it. I was engaged for a year on the journey here referred to; and another year elapsed before the mission was finally dissolved. The whole of that period was employed in such inquiries regarding the kingdom of Cabul as were likely to be useful to the British Government. The first part of the time was spent by all the members of the mission in the acquisition of general information; but during the remainder, a precise plan was arranged among the party, and a particular branch of the investigation assigned to every gentleman who took a share in it." It was Mr. Elphinstone's labour to combine the whole results of this research into a compact and homogeneous work.

The "Narrative of the Proceedings of the Mission," from Mr. Elphinstone's own pen, which forms the Introduction to the book, is one of great value. We follow in it, with deep interest, the travellers from Delhi to Pesháwar. It is from them that we get the first reliable information respecting the secluded States of Shekháwátí and Bikáner, and the country contiguous to Multan. Their journey, in advance of these places, brought many novelties to notice, connected not only with the physical features and productions of the countries through which they passed, but with the appearance and manners and customs of the various tribes by which they are inhabited. As a traveller, Mr. Elphinstone was observant and conciliatory in no common degree; while he constructed his story with the most scrupulous regard to truth and accuracy, avoiding all kinds of inflations and exaggerations.

Mr. Elphinstone, from political reasons, scrupulously abstains from saying anything to the public connected with the political negotiations in which he was engaged; but he gives us a lively view of the state of parties dominant in Afghanistan, and of the public ceremonial of the Court of Cabul at the time of his intercourse with it at the appointed place of meeting. Of Pesháwar itself he also furnishes us with an interesting account. The incidents of his return journey to Delhi he does not relate at any considerable length.

In the body of Mr. Elphinstone's work we have a mass of digested information, mostly entirely new at the time that it appeared, and still maintaining its freshness and value, notwithstanding all the additions made to it by Captains Burnes and Conolly, and subsequent travellers. The geographical description which it gives of Afghanistan,—of its situation, boundaries, mountain-chains, rivers, and river-systems; its natural and political boundaries; its climate and effects; and its animal, vegetable, and mineral productions, though by no means all derived from personal observation, has been found to be unusually accurate. Of

the Afghan people,—their early history, form of government, social and religious state, manners and customs, agricultural and commercial resources, and associated tribes,—it presents us with a description which will ever be referred to as the first and successful attempt to bring them to the notice of the curiosity and intelligence of Europe. No subsequent accounts which we have received of this people have the fulness and precision of Mr. Elphinstone's book, which will long remain a standard work on the matters of which it treats. It is an honourable monument of the research and ability of the more distinguished men of the Indian Service in the generation which has just passed away, and of which Mr. Elphinstone himself was the last, and, all things considered, the best representative.

Mr. Elphinstone's public engagements at Puná after this work had been given to the public were entirely adverse to continued authorship. His principal occupation there was that of watching, and, if it had been practicable, preventing, the development of the treacherous plans of the Peshwa and of other unfaithful members of the Maráthá confederation. He was not taken by surprise when the crisis occurred in 1817. He narrowly escaped from the snares laid for his own destruction; and, though he had but a small force at his disposal, under Colonel Burr, he compelled the Peshwa to retire, and to commence those unmeaning movements in the Dakhan which soon led to the exhaustion of his forces and his own overthrow. The guiding mind of this short but decisive and final Maráthá war, though the supreme authority was in the hands of Lord Hastings, was that of Elphinstone. On him, too, devolved the settlement of the Maráthá Country after the war; and this he effected with unexampled judgment, consideration, and ability. Higher practical duties than those which he discharged have never, all things considered, and especially the influence of the Maráthá nation on the whole of India, fallen to the lot of an eastern statesman. Let his "Report on the Territories conquered from the Peshwa," submitted to the Supreme Government of British India in 1819, and printed at Calcutta in 1821, and reprinted in Bombay in 1838, be the witness in this case. In this very valuable state paper, we have a general view of the geography of the Maráthá Country, a brief sketch of Maráthá history, and an able review of its revenue system, and of its police and criminal and civil justice, with valuable hints for the improvement of every branch of the Government administration. The peculiarities of his own rule,—for such it was,—were liberality to the influential classes of society, caution in dealing with all classes of the people, and quiet endeavours to promote the amelioration of their condition. He

had a more favourable opinion at first of the indigenous means of native improvement than he was afterwards led to form. While he says, "I do not perceive anything that we can do to improve the morals of the people, except by improving their education," he adds, "I am not sure that our establishing free schools would alter this state of things, and it might create a suspicion of some concealed design on our part. It would be more practicable, and more useful, to give a direction to the reading of those who do learn, of which the press affords so easily the means." These early opinions of the party who afterwards became the founder of Government education in the Bombay Presidency, and whose name is associated with all our subsequent advancement, are worthy of being specially marked. The judgments of Mr. Elphinstone varied with his information and experience to the end of his life. He had no stereotyped prejudices.

The appointment of Mr. Elphinstone to the Government of Bombay in 1819, was a strong testimony to the confidence reposed in him by the East India Company and the Ministry of the day, particularly Mr. Canning. Amongst the parties proposed with himself for the office, were Munro and Malcolm; but in this illustrious trio he was worthy of the precedence. The excellent spirit in which he conducted the administration of the West of India will never be forgotten in this locality.

Mr. Elphinstone was elected President of this Asiatic Society on the 29th November 1819, shortly after he assumed the Government; and he continued exactly eight years in office. During this time he conferred upon the Society many personal and public favours. In December 1819 he sanctioned the use of the South-West Ravelin, with its buildings, for an Observatory under its direction. On the 28th March of the following year, he presented it with a most valuable collection of books, containing 179 works in literature, history, and science, and comprising 280 volumes. It was through his influence, too, that the Society came into the possession of a great many of the most valuable of its Sanskrit manuscripts, from the collections of Dr. John Taylor and of Major Miles, which were presented to it by the Court of Directors of the East India Company on his solicitation.

Mr. Elphinstone retired from the presidentship of the Society in November 1827, when he was about to leave India for Britain. On this occasion, an address recognizing the obligations to him of the Society was delivered by the then Secretary, Major Vans Kennedy, from which, as it has never, so far as is now known, been given to the public, a few passages, irrespective of some digressions which it contains, may be here introduced.

"It must be admitted that, from a singularly diffident and retiring disposition, which is so often the accompaniment and ornament of real ability, neither our labours have been animated by those discourses, nor our Transactions enriched with those memoirs, which Mr. Elphinstone was so competent to compose. For if not a profound classical scholar, he was sufficiently master of the Greek and Latin languages to enable him to appreciate and enjoy the matchless works of antiquity; and with the modern literature of his own country, France, and Italy, he was intimately acquainted. His active life, however, and public duties, restricted his knowledge of the numerous languages of Asia, to a conversancy with Persian,* and prevented him from prosecuting even in that language the study of Oriental learning by applying to its original sources. But his information on all subjects connected with it, and particularly with the civil and political history of Persia and India, was most extensive. That cause, perhaps, united to the correct and elegant taste which he had derived from nature, but which he had improved and sedulously cultivated by the perusal of the best ancient and modern authors, rendered him a rather too severe critic of Oriental composition. He denied not indeed that its occasional beauties deserved every praise, but he was inclined to think that these could not compensate for its numerous imperfections. This opinion, however, applied merely to the critical merits of Eastern literature; for he evinced, by many enlightened acts, his firm conviction that the Government of this country could not be conducted efficiently and prosperously for many years without adapting it, as far as the real interests of the people would admit, to their long-established and deeply-rooted habits and prejudices; and hence it was that, in order to acquire an accurate knowledge of their customs, usages, and laws, he encouraged with the utmost munificence the study of the native languages and literature.

"But from his estimation of the native character, which he must have received in its most unfavourable light during his official intercourse with the late Peishwa, whose conduct and that of his Ministers during the last six years of his Government were so marked with duplicity and disregard of every principle of honour and rectitude, Mr. Elphinstone was persuaded that mental and moral improvement were indispensable for securing the real prosperity of this country, and for enabling the people to understand and appreciate that impartiality, integrity, and justice which distinguished the British Government. Education, there-

* To this the Hindustání should have been added, for his knowledge of which he was commended by the Duke of Wellington.

fore, appeared to his enlightened view the most safe and efficient means for improving the native mind, and rendering the people eventually qualified for a participation in the government of their own country; and Mr. Elphinstone therefore encouraged with the most liberal support the establishment and exertions of the *Native Education Society*, which promise to be attended with much beneficial results. . . .

"I am induced to touch upon this point [the desirableness of the study of the Indian languages] because the expectation thus expressed is now more likely to be accomplished in consequence of the zeal to acquire a knowledge of the native languages and literature which the enlightened measures and discriminating patronage of Mr. Elphinstone have from the commencement of his Government excited amongst the gentlemen of the Civil Service, the beneficial effects of which have been already displayed by the publication of several important works; and though the selection of these has been directed by the laudable desire of ameliorating the administration of justice, still it may be confidently anticipated that the zeal which has been awakened will not be confined to one subject, and that the difference of dispositions will naturally lead to a difference of pursuits.

"It is not, however, by his public measures or private exertions alone that Mr. Elphinstone has thus successfully contributed to the promotion of literature. For his invaluable account of the Embassy to Cabul will ever remain a memorial, and I hope not the only memorial, of his eminent literary qualifications; and from the public applause which it has so justly received, it must also afford a most inciting assurance that neither an active life nor official business does necessarily prevent the prosecution of intellectual pursuits . . . It was therefore to that instructive intercourse; to that courtesy with which Mr. Elphinstone listened to those with whom he conversed; to that unassuming and engaging manner with which he communicated the copious and diversified stores of his own knowledge, and to the bright example of his literary excellence, that is principally to be ascribed the more general diffusion of a literary taste throughout this Presidency. For it was impossible to be admitted into the society of so highly talented an individual without admiring his commanding abilities, and being sensible that literature most eminently contributed to adorn his richly cultivated mind."

A still more graceful tribute was given about the same time to Mr. Elphinstone by Bishop Heber in his *Journal*, which, though it did not appear till after the death of its amiable author, excited much interest at the time it was published in England, and which is still possessed of

much interest to those who seek for general information, communicated in a pleasing form, respecting this great and interesting country.

"I had enjoyed," says the Bishop, "in the unremitting kindness, the splendid hospitality, and agreeable conversation of Mr. Elphinstone, the greatest pleasure of the kind which I have ever enjoyed either in India or Europe.

"Mr. Elphinstone is, in every respect, an extraordinary man, possessing great activity of body and mind, remarkable talent for and application to public business, a love of literature, and a degree of almost universal information, such as I have met with in no other person similarly situated, and manners and conversation of the most amiable and interesting character. While he has seen more of India and the adjoining countries than any man now living, and has been engaged in active political, and sometimes military, duties since the age of eighteen, he has found time not only to cultivate the languages of Hindustan and Persia, but to preserve and extend his acquaintance with the Greek and Latin classics, with the French and Italian, with all the elder and more distinguished English writers, and with the current and popular literature of the day, both in poetry, history, politics, and political economy. With these remarkable accomplishments, and notwithstanding a temperance amounting to rigid abstinence, he is fond of society, and it is a common subject of surprise with his friends at what hours of the day or night he finds time for the acquisition of knowledge. His policy, so far as India is concerned, appeared to me peculiarly wise and liberal, and he is evidently attached to and thinks well of the country and its inhabitants. His public measures, in their general tendency, evince a steady wish to improve their present condition. No Government in India pays so much attention to schools and public institutions for education [as his]. In none are the taxes lighter; and in the administration of justice to the natives in their own languages, in the establishment of panchaets, in the degree in which he employs the natives in official situations, and the countenance and familiarity which he extends to all the natives of rank who approach him, he seems to have reduced to practice almost all the reform which had struck me as most required in the system of government pursued in those provinces of our Eastern empire which I had previously visited. His popularity (though to such a feeling there may be individual exceptions) appears little less remarkable than his talents and acquirements; and I was struck by the remark I once heard, that 'all other public men had their enemies and their friends, their admirers and their aspersers, but that of Mr. Elphinstone everybody spoke highly!' Of

his munificence, for his liberality amounts to this, I had heard much and knew some instances myself.

“With regard to the free press, I was curious to know the motives or apprehensions which induced Mr. Elphinstone to be so decidedly opposed to it in this country. . In discussing the topic he was always open and candid, acknowledged that the dangers ascribed to a free press in India had been exaggerated,—but spoke of the exceeding inconvenience, and even danger, which arose from the disunion and dissension which political discussion produced among the European officers at the different stations, the embarrassment occasioned to government by the exposure and canvas of all their measures by the *Lentuli* and *Gracchi* of a newspaper; and his preference of decided and vigorous to half measures, where any restrictive measures at all were necessary. I confess that his opinion and experience are the strongest presumptions which I have yet met with in favour of the censorship.*

“A charge has been brought against Mr. Elphinstone by the indiscreet zeal of an amiable, but not well-judging man, the ‘Field Officer of Cavalry,’ who published his Indian travels, that ‘he is devoid of religion and blinded to all spiritual truth.’ I can only say that I saw no reason to think so. On the contrary, after this character which I had read of him, I was most agreeably surprised to find that his conduct and conversation, so far as I could learn, had been always moral and decorous; that he was regular in his attendance on public worship, and not only well-informed on religious topics, but well-pleased and forward to discuss them; that his views appeared to me, on all essential subjects, doctrinally correct, and his feelings serious and reverential; and that he was not only inclined to do, but actually did, more for the encouragement of Christianity and the suppression or diminution of *Suttees*, than any other Indian Governor has ventured on. That he may have differed in some respects from the peculiar views of the author in question, I can easily believe, though he could hardly know himself in what this

* Compare with this the following extract of a letter of Mr. Elphinstone addressed to Sir Edward Colebrooke during the mutiny of 1857 :—

“I am afraid it is too late to put any effectual restraint on the press in India. *The press* is a great system of circulation, of which the types and printing machines form only a part. When the art is once understood, a very small quantity of printing even in a language not more generally understood than English in India, is enough to furnish materials for a great quantity of manuscript, as well as of declamation, conversation, dissemination of rumours and alarms. This of itself would be more than a match for the Indian Government, and it would have an irresistible auxiliary in the press and public opinion of this country.”

difference consisted, since I am assured that he had taken his opinion at second-hand, and not from anything which Mr. Elphinstone had either said or done. But I have been unable to refrain from giving this slight and imperfect account of the character of Mr. Elphinstone as it appeared to me, since I should be sorry to have it thought that one of the ablest and most amiable men ever met with was either a profligate or an unbeliever."

This tribute of admiration and gratitude, so creditable to Bishop Heber, is as truthful as it is beautiful and generous. Mr. Elphinstone, though the administration of supreme power of India was never in his hands (though it was pressed on his acceptance) was actually, in some important respects, the greatest of our Eastern statesmen. He excelled all our distinguished rulers in the knowledge of the country and people of India, and in the adaptation to them of public measures. In private intercommunion, both with natives and Europeans, he ever displayed a suavity, sincerity, dignity, and impartiality, which never failed to secure their respect and affection. His respect for religion was exactly as intimated by Bishop Heber. He was a regular attendant on divine ordinances; and he constantly expressed his regard, both by word and action, for the great principles and influences of our holy faith. He was not only tolerant of but friendly to the Mission cause, before it was duly appreciated by multitudes in authority in India. He was a regular and large contributor to the Bombay Bible Society, to the Scottish Mission (to the commencement of which he gave his decided countenance), and to other religious institutions, as shown in their annual reports. Under his government, allotments of two or three pieces of ground were made for schools to the American Mission, which were probably the first instances of "grants-in-aid" made in India.

To the "mixture of religion" with the Government plans of education, Mr. Elphinstone was decidedly opposed. The reasons of his opinion on this subject it is right to give in his own words:—"I am convinced," he wrote in his Minute on Education, "that the conversion of the natives must infallibly result from the diffusion of knowledge among them. Evidently they are not aware of the connection, or all attacks on their ignorance would be as vigorously resisted as if they were on their religion. The only effect of introducing Christianity into our schools would be to sound the alarm, and to warn the Brahmins of the approaching danger." It was only by degrees, indeed, that Mr. Elphinstone got to the position which he ultimately occupied with regard to native education. When he was Commissioner in the Dakhan,

as will have been already noticed, he was doubtful of the propriety of Government doing more than giving encouragement to the production of edifying works through the native press. In 1820 he took a decided step in advance: he presided over the meeting of the Bombay Education Society, at which the Native Education Society may be said to have originated. The primary object of that institution was the conveyance of knowledge through vernacular instruction. In 1823 he recorded his opinion that "without great assistance from Government, no progress can be made in that important undertaking." He proposed that Government should both encourage the existing society and add to its resources. "The following are the principal measures," he wrote, "required for the diffusion of knowledge among natives:—First, To improve the mode of teaching at the native schools, and to increase their number. Second, To supply them with school-books. Third, To hold out some encouragement to the lower orders of natives to avail themselves of the means of instruction thus afforded them. Fourth, To establish schools for teaching the European sciences and improvements in the higher branches of education. Fifth, To provide for the preparation and publication of books of moral and physical science in the native languages. Sixth, To establish schools for the purpose of teaching English to those disposed to pursue it as a classical language, and as a means of acquiring a knowledge of the European discoveries. Seventh, To hold forth encouragement to the natives in the pursuit of those last branches of knowledge." "The means by which the direct exertions of Government can be best applied to promote schools," he added, "is by endeavouring to increase their number, and on this I am of opinion that no pains should be spared." He was gratified beyond measure, when, on retiring from the Government of Bombay, he found the native princes, chiefs, and gentlemen of the Presidency, and its dependencies, determined to express their admiration of his character, and to perpetuate his name by the endowment of ELPHINSTONE PROFESSORSHIPS for teaching the literature and science of Europe, which they effected on a magnificent scale. This commemoration was even more gratifying to him than the determination to place his statue in the Town Hall, as was in due time done. "I am told," says Sir Edward Colebroke, "that when the proposal to raise the last-named tribute (that of the College) to his fame was announced to him, '*Hoc potius mille signis*' was the eager reply." In the prosperity of the College he ever rejoiced. Its first Professor and Principal, our learned Vice-President, Dr. John Harkness, was his own selection, on the recommendation of the venerable Professor Pillans of Edinburgh.

Mr. Elphinstone, as is well known, went into strict retirement soon after he reached the British shores; but his interest in India, in which he had spent the more active portion of his life, continued undiminished. His leisure he spent principally in researches connected with its most eventful though peculiarly obscure history. The fruit of his study in due time appeared. In 1841 he published his well-known "History of India, embracing the Hindu and Muhamadan Periods," a work of so much value that it is not likely to be superseded, though it requires additions and annotations corresponding with the late progress of Oriental research, particularly as connected with the more ancient literature of the Hindus. It opens with a general description of India, in which the author's own intimate acquaintance with the country is very apparent. It reviews, under appropriate headings, the state of society at the time of Manu's Code, presenting the best analysis which has yet been made of the more important portions of that curious work; and it minutely and successfully contrasts that state of society with that of the Hindus in later times, in connexion with which it ably reviews the changes in caste, in government, in law, in religion, in philosophy, in science, in geography, in chronology, in language, in literature, in the fine and mechanical arts, in commerce, and in the manners and character of the people. It notices the prominent facts and traditions connected with the Hindu dynasties in the upper provinces of Hindustán, in Central India, in Gujarát, and in Southern India. It then takes up the earlier Muhamadan History of India, which it treats in a masterly manner,—commencing with the Arab conquests in Sindh; passing on to the dynasties formed after the breaking up of the empire of the Khalifs; presenting a graphic view of the different expeditions into this country of Mahmud, and his successors dominant at Ghazní and Lahor; and giving an interesting view of the kings of Delhí and of the Government of the houses of Toghlak, of the Sayyids, and of the house of Lodí to the commencement of the house of Taimur. Of the later Muhamadan history, commencing with the reign of Bábar,—embracing the great names of Humáyun, Akbár, Jahángír, Sháh Jehan, Aurangzíb, and his successors, and including notices of the inferior kings of Hindustán, Gujarát, and the Dakhan—it presents us with a digested summary, in framing which, from a great variety of sources, the greatest patience, tact, and judgment are apparent. This part of the work has an interest to the general reader scarcely inferior to that of the most stirring portions of European history. Of the principal characters of which it treats, it furnishes most correct portraits, which can never fail to at-

tract attention. Honesty, judgment, and simplicity of style (too much akin, however, to that of official correspondence), are the characteristics of the work from beginning to end. For educational purposes it is invaluable.

The History of the British Empire in India, it is to be regretted, Mr. Elphinstone did not find time to write. Few persons, however, had such qualifications for such a work as those he undoubtedly possessed. His acquaintance with the principles and proceedings of our great Indian statesmen was perfect; and no individual was better fitted than himself to trace and narrate their consequences. Even in his retirement,—from which the repeated offers of the Governor-Generalship of India failed to withdraw him,—he became the Nestor of Indian politicians, consulted by the Indian Government at home and by its servants abroad in all cases of importance and difficulty. To the unexpected and disastrous events which occurred in India in 1857-58, he directed much attention; and during this most trying period he was a constant counsellor and encourager of his highly-esteemed nephew, John, Lord Elphinstone, the distinguished Governor, and under God, in an important sense, the saviour of this Presidency. It is consistent with the knowledge of his friends that he was decidedly of opinion, after much inquiry and perusal of documents, public and private, that the lamentable rising of the Bengal Army had no connexion with any deep-laid political conspiracy throughout India.

Mr. Elphinstone's interest in all matters connected with our local Oriental research, I may add, continued undiminished to the last. Of this fact I may adduce a pleasing illustration, though it is of a personal character. On receiving a copy of my "Notes on the Constituent Elements, the Diffusion, and the Application of the Maráthí Language," prefixed to the last edition of Molesworth's Maráthí Dictionary, he thus wrote to me: * "I had yesterday the pleasure of receiving the copy of the Notes on the Maráthí Language, which you were so kind as to send to me, and for which I beg you to accept my best thanks. I read them with the greatest interest, and with proportionate satisfaction. The subject was one about which I had great curiosity, and very little knowledge, and on which I did not know where to look for information. The difference of the Scythian element in Maráthí from that of the other languages of the Deckan is quite new to me, and may perhaps lead to the discovery of a connection between the nation and some of those north of the Nerbudda, and so

* 21st November 1857.

furnish a clue to the history of its settlement beyond the limits of the rest of the A'rya race. It is satisfactory to see the disposition there is among the Maráthás to print the works already existing in their own language, as promising the means of diffusing knowledge of more value than what they now possess. I need not say how much I am honoured by the mention you made of me in this part of your dissertation." Mr. Elphinstone had in historical antiquities, as in politics, great readiness in marking every important fact which might be elicited, and of making of it its distinctive and appropriate application.

Mr. Elphinstone's death occurred on the 20th November 1859, at Hookwood, near Limpsfield, where he had lived in peaceful retirement for several years. Its immediate precursor was a stroke of paralysis, which proved fatal in a few hours, during which he remained in a state of insensibility. His removal attracted little attention from the general public in England; but it did not fail to be noticed by his numerous Indian friends and admirers, who offered to his memory such tributes of affection and respect as he received when he left the shores of the East. A statue to his memory is to be erected in St. Paul's Cathedral. A subscription for his bust was made by the students and ex-students of the College in Bombay which bears his honoured name. Many of the Chiefs of the Maráthá Country expressed their sorrow at the bereavement, which, sympathizing with the traditional feelings of their families, they understood they had experienced. "We have lost," I heard H. H. the Holkar say, a few weeks after the event occurred, "our friend, and the friend of our country."

I shall be pardoned for quoting, in conclusion, the following notice of Mr. Elphinstone's death from the pen of the party most deeply affected on the occasion, his attached and amiable nephew, Lord Elphinstone. It is from a letter addressed to me on the 13th January 1860 :—

"I have to thank you for your kind letter of the 6th, from Deesa. I feel very grateful to you for the sympathy you express upon the loss I have sustained in my uncle's death. Of all the men I have ever known, I loved and respected him the most. Upon all occasions of difficulty I looked to him for counsel and encouragement. I was in frequent correspondence with him to the last; and I feel that his place can never be supplied. On the other hand, although his death was very sudden, I cannot say that I was surprised at it. When I came out to India, my hopes of seeing him again in this world were very slight. He was then 74; and his health was always delicate. Yet, as years passed away, and as he continued to write to me with his usual

vigour and interest in this country, I could not but hope that I should be permitted to see him again. And as the time of my probable return approached, this hope grew stronger. It was with feelings of sorrow and disappointment therefore, rather than of surprise, that I received the account of his death.

“There is indeed much for which I can never be sufficiently thankful. In the first place, that it pleased God to allow my dear uncle to retain the possession of his intellect unimpaired to the last. Of all things the saddest is to see a great mind in decay; and this trial I have been spared in his case. Then I have every reason to believe that his death, though at the last sudden, did not find him unprepared. He made some slight alterations in his will within a month of his death; and a letter was found with it addressed to me in which he begs that his papers may not hastily, or without due reservation, be made over to any one for publication. All his papers were found in the most admirable order; and I have requested that they may be kept exactly as he left them until I return. He has remembered most of his relations and all his servants in his will; and more than one of his bequests show his delicacy and thoughtfulness towards others. He was indeed one of those who delighted in doing good by stealth.”

It was the intention of Lord Elphinstone to superintend the publication of his uncle's papers. But alas! he was destined to be in a few months his companion in the tomb. These treasures, however, will doubtless be ere long given to the public, to which they cannot fail to be peculiarly interesting and instructive. To an able Memoir of Mr. Elphinstone by Sir Edward Colebrooke, Bart., M.P., in the last No. of the Journal of the Royal Asiatic Society, which has come to hand as this short notice is going through the press, the reader is directed for the general story of Mr. Elphinstone's life. That Memoir is enriched with a portion of Mr. Elphinstone's correspondence with its author, and interesting reminiscences by General Briggs, Mr. John Warden, and others who personally enjoyed his friendship during his days of active service in India.

ART. VI.—*Genealogical and Historical Sketch of the Gohel Tribe of Rajpoots, translated from a Document in possession of the Bhaonuggur Raja.* By Col. LEGRAND JACOB.

Presented 13th August 1857.

GOHEL SREE SALIVAHUN was supreme. He reigned in Moongeeppoor Patun; his era commencing with that of Vikremajeet S. 135. His race is as follows :—

1. Gohel Salivahun.
2. „ Sudewunt.
3. „ Sonukjee.
4. „ Geheojee.
5. „ Veerumjee.
6. „ Ramjee.
7. „ Wuchrajjee.
8. „ Sangojee.
9. „ Hunsrajjee.—This prince came from Marwar to Khere (Kaira), and there reigned.
10. „ Dharukjee.
11. „ Bhojrajjee.
12. „ Prithirajjee.
13. „ Poorun Chandjee.
14. „ Jussregjee.
15. „ Dhoondlee Muljee.
16. „ Umur Paljee.
17. „ Segpaljee.
18. „ SesModulejee.
19. „ Jhanjhojee.
20. „ Seehajee.
21. „ Khutmuljee.
22. „ Wagjee.
23. „ Ununtraejee.
24. „ Sajee,—who swam his horse in the sea, and gave it to his Bhat.
25. „ Seehajee.

26. Gohel Sejjaljee.
27. „ Jhajhursejee.
28. „ Sejjukjee.—This chief founded the Gohel raj in Soorashtra. He came from Marwar into the Punchal district in S. 1102, and built Sejjukpoor, now belonging to the Kattees. He had
29. „ Gohel Ranojee.—three sons, viz. the eldest Ranojee, who built Ranpoor in S. 1201. The second Urjunjee, who established himself in Artheela, afterwards changed to Lathee. The third son Suwajee settled in Guriadhar, whence the Palitana family.
30. „ Mokrajee,—commonly called Mokra Gohel. He took Bheemrad, and afterwards came to Oomrala; thence he conquered Wulla, and afterwards Khokra. Trikalia Coolee reigned in Perim in S. 1275. Him he killed, and took the island; thence he conquered Gogha (Gogo); and there residing he plundered vessels as far as Tejuntoree. The Padishah's army came in consequence of this, and a bloody fight ensued, in which Mokrajee was slain. His head lies near the Khujooria Chotra (the date-tree platform) at Gogha. His body continued fighting after this for the distance of nine kos, until it fell at the Khudarpoor ridge—such manhood was he endowed with. Mokra had two sons, the eldest—
31. „ Doongurjee,—reigned in Gogha, &c.; the second son, Sesmuljee, took Rajpæpla, where his race rules to this day.
32. „ Weejuljee.—Weejuljee had two sons: the eldest Kuhanjee.
33. „ Kuhanjee,—died in battle with the Padishah's army.
34. „ Rawul Sarungjee.—His son Sarungjee was retained as hostage until the payment of the fine imposed. The second son, Ramdasjee, seated himself on the Gadee, not caring to release the heir. A Koombar* of Kooleak was in the service of the captive prince. He placed him in a pannier, and, thus concealing him, fled with him and gave him in charge of the Munt (head) of a company of Uteets, explaining that the boy's sister was married to the Doongurpoor Rajah Rawul Jusmut Sungjee. As requested by the potter, they conveyed thither the Koour.† Here Ramdasjee was reigning over Gogha. The Lathee and Guriadhar chiefs attacked him, saying they would not permit a Phutaya‡ to reign whilst the lawful heir was captive. The Lathee chief seized the Walookur Purguuna of twelve villages, and the Guriadhar

* A potter.

† A prince.

‡ Lit., “torn off,” a collateral branch.

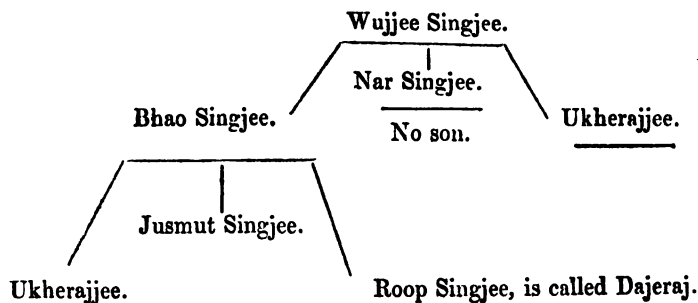
chief received a bribe of Goonda and other twelve villages to keep him quiet. After a short time passing in this fashion, the Doongurpoor Rawul gave his army to Sarungjee and seated him on his Gadee at Gogha, giving him his own title of Rawul. The villages that had fallen under Lathee and Guriadhar were confirmed, but with a writing in Sarungjee's name, and held on tenure of giving him aid. Thirty-three villages were assigned to Gohel Ramdasjee, and his race are called Gho-gharee; his grass was :—

7	villages under	Ookhurda	} These villages inclusive.
7	„	„ Ugeealee	
7	„	„ Akolalee	
12	„	„ Monpoor	
<hr/>			
33	villages.		

35. Gohel Rawul Shuwdasjee.—He married the daughter of Sree Deewar, the Chitoor Rana. He went to the assistance of his father-in-law, and fell in the battle. His wife performed Suttee, leaving three sons—
36. „ Jetjee.
37. „ Ramdasjee.—He had three sons; the second, Sadooljee, received Udhewano in grass; the third, Bheemjee, received Tana in ditto.
38. „ Suttajee,—had four sons. The second, Rawul Dewajee, received Puchegam in grass, and his race are called Dewanee. The third son, Weernajee, received Uwanioo in grass; his race are called Wachanee, by corruption from Weeranee. The fourth son, Mookajee, received Nuwanioo.
39. „ Weesojee.—He took Seehor from the Brahmins in S. 1575.
40. „ Ghoonajee.
41. „ Ukherajjee.
42. „ Ruttunjee.—His second son, Gowindjee, received Bhundaria, &c. (twelve villages) in grass. His race are called Gowindaree.
43. „ Hurbhumjee.
44. „ Ukherajjee,—was a child on his father's death. His uncle Gowindjee, who accompanied the Mahomedan armies, had influence enough to retain the Gadee for himself at Seehor. Ukerajjee, fearing death, fled to Bhooj. The Wachanees and Dewanees were favourable to his cause. The Nuwab of

Goojerat came into the country, and Gowindjee acted as chief of his army. The Nuwab became jealous of him, and caused him to be poisoned. The Wachanees broke into the palace, in order to carry off Gowindjee's son, Chütursaljee. The Khoomans, with a party of horse, had come to pay condolence on the father's death. They released the Kour, and made an arrangement by which he retained Bhundaria and twelve villages; and Ukherajjee was sent for from Bhooj, and placed on the Gadee. He had four sons. The second, Hurbhumjee, received Wurtex in grass. The third, Wujja-jee, received Thorree. The fourth son received Muglana.

45. Gohel Rutun Singjee,—was killed in the Gurer valley.
46. „ Bhao Singjee,—founded the city of Bhaonuggur in S. 1779, A.D. 1723. He had five sons—
 The second, Rawul Weesajee, received the Wulla Purgunna.
 The third, „ Goyajee, „ Rampoor.
 The fourth, „ Ramdasjee, „ Huliad.
 The fifth, „ Morbhan, „ Ruttunpoor.
47. „ Rawul Ukherajjee.
48. „ Wukut Singjee.—He took and reigned over Tullaja, Botad, Patna, Muhoowa (*i.e.* Mowa), the Lathee Pargunna, Gudra, Goondaloo, Koondla, Rajoola, and other places. He died Phagun wud 1, S. 1872. He had three sons—
 The second, Rawul Bapjee, received Rohel, &c., three villages.
 The third „ Rao Singjee „ Bhalwao.
49. „ Rawul Wujjee Singjee,—the present chief. His family is as follows :—



Bhaonuggur, 25th January 1843.

ART. VII.—*Description of some of the Kanheri Topes.* By E. W. WEST, Esq. [*With a Plan and Drawings.*]

Presented 10th October 1861.

AMONG the excavations at Kanheri that are rarely visited, although containing several objects of interest, is the long open gallery under the south-western brow of the cave-hill, numbered 38 on the general plan of the caves. This gallery is the first excavation that comes in sight when approaching the caves from the direction of Tulsī, as the path passes near the foot of the precipitous slope beneath the gallery, when about a mile from the Chaitya. There can be no doubt that this, and also the other galleries Nos. 39, 40, and 41, are merely artificial enlargements of natural hollows in the face of the precipice, where a stratum of soft perishable rock lies between two harder strata. The two latter, being exposed to the rain, become blackened, while the softer stratum decays into dust, and is blown away, leaving a long hollow under the brow of the hill, where the rock, being sheltered from the rain, remains of its natural yellow sandy colour. Many such hollows occur in the valleys to the north-east of the caves, some of which have been enlarged by art, but are scarcely accessible.

The only safe entrance into gallery No. 38 is from above, where a path cut in the rock, and furnished with steps where necessary, traverses the lower plateau of rolling ridges, and may be approached either down the steep slope south of cave No. 55, or by keeping below the terrace-wall in front of cave No. 36, which latter cave appears to have been excavated across the original course of this rock-path, and consequently at a later date. Following this path southwards, it turns suddenly to the right over the brow of the precipice, alongside which it descends by steps (cut in a rock almost detached by a deep fissure), which are in a very broken condition, and terminate in another rock-path, leading northwards into No. 39, and southwards into No. 38.

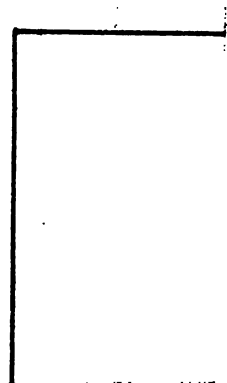
Following the path into No. 38, we descend some steps and ascend others to the level of the floor of the gallery, and soon are sheltered by the rock above. Here occur the letters cut in the rock, forming the back of the gallery, which constitute No. 22 of the Kanheri Inscript-

tions; and the floor of the gallery, which seems covered with brick-dust, is found to consist of the foundations of small brick topes buried in their own *débris*, and probably from 15 to 20 in number, though only 7 of them have been opened out, and marked on the accompanying plan of the gallery. Beyond these are the ruins of a large stone tope, which will be more particularly described hereafter. Behind this tope are three small chambers, containing much sculpture, but, owing to the perishable quality of the rock, it is in a very decayed state. The first chamber has a group on both sides and at the back, each consisting of a large sitting figure with attendants, two of the attendants in each group being life-size; there is also a small sitting figure outside, between this chamber and the next, with two larger figures below. The second chamber has a sitting figure with attendants on the left wall; a standing figure with attendants on the back, and several small sitting and standing figures on the right. The third chamber has a standing figure with attendants on both side-walls (those on the left nearly obliterated), and a sitting figure with attendants on the back; there have also been some sculptures outside this chamber. In all these chambers there are some remains of plastering and traces of painting.

Passing the large tope, the floor of the gallery suddenly rises about 14 feet to a short level, on which are the foundations of 11 small brick topes, buried in their *débris*; then another rise of 3 feet to a level containing the foundations of 33 similar topes, which have been buried in their *débris*. These topes have been built upon a platform paved with brick, and the rock above is cut out in some places to make room for them. The brick *débris*, indicating further topes, extends just beyond the fourth chamber, which is semicircular, with a small rock dagob in the centre, much decayed, and a small recess at the back, about two feet above the floor-level, which is two feet below the surface of the brick *débris* outside. From this point, the bricks disappear for about 80 feet, the floor of the gallery beginning shortly to ascend, past another semicircular chamber, above the level of the gallery, with a small rock dagob in the centre, and an umbrella-shaped canopy cut on the ceiling; then past a dagob in bas-relief and the commencement of a cell, where the brick *débris* appears again, and continues for about 200 feet, no doubt covering the foundations of a row of brick topes, with a second row for some distance. The floor of the gallery then rises rapidly to the end, where there is a bench cut in the rock, commanding a fine view in the direction of Bassein. Near the end of the gallery are three recesses, with benches, from 6 to 10 feet above the level of the floor; and below the first recess are three sockets cut in the rock,

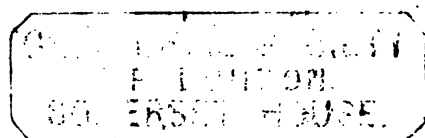
The tope was probably built solid, the inner portion being of stone obtained from the neighbouring rocks; but it had been formerly broken open, to the extent shown in the section, and the square hole O (cut in the rock) had been emptied of its relics, as also the shallower receptacle S, and the rough stone cover of one of these depositories for relics was found among the ruins, having a square hollow sunk into its lower side.

The foundations of all the brick topes that have been cleared have the form shown in the drawing: they are of three sizes, 6 feet, 5 feet 3 inches, and 4 feet 6 inches in diameter at the bottom; and are built solid, of large flat segmental bricks (shaped in moulds) on the outside, and of square flat bricks within. All the brickwork has been covered with a thin coat of white plaster, which does not appear to have been painted. As eight of these topes were carefully searched down to the rock without any relics being found, it is probable that the place of deposit was in the cupola, which is destroyed in every instance. In two of the cleared topes a small plain stone was found occupying the place of a portion of two courses of the brickwork just above the mouldings, and this probably existed in all; a similarly shaped stone was found among the brick *débris* between the topes, which had an inscription on its circular face; this is No. 58 of the Kanheri Inscriptions. Many square stones cut in steps, and with a square hole through them, have been found among the brick *débris*, and evidently form ornamental tops for these topes. The number of foundations cleared and distinctly traced amounts to 54, and probably about 50 more foundations of these brick topes remained buried. It seems likely that these topes have contained the ashes of the priesthood, and that this gallery has been the general necropolis of the caves.



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2



Large sculptured stone Tōpe.

Scale $\frac{1}{2}$ of an inch to a ft

for top of Tōpe

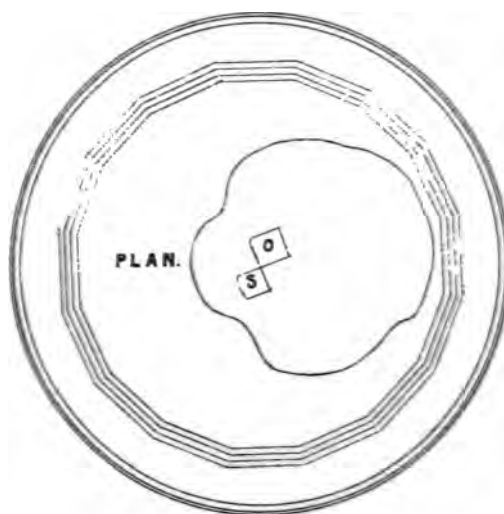
decayed sculptures.

Overhanging rock cut out

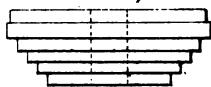
SECTION.



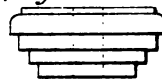
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Stone Top.



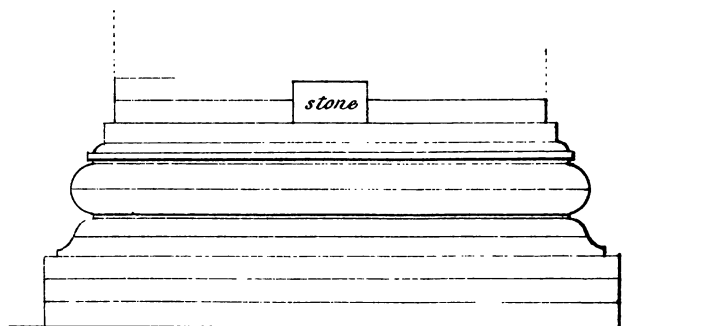
Stone top of smaller Brick Top.



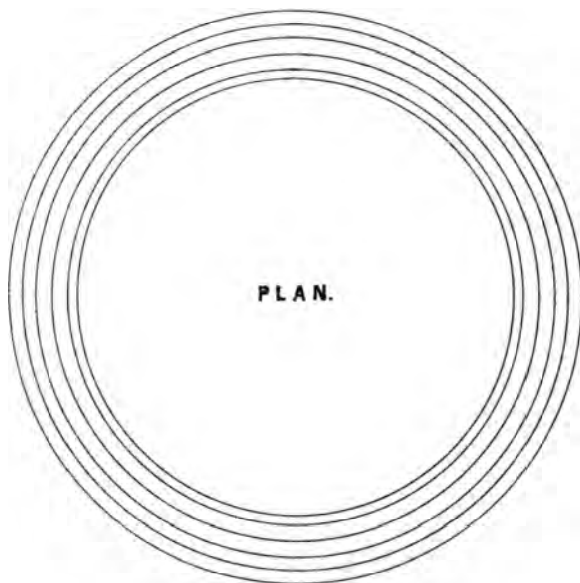
Brick Top.

Scale 1/2 inch to a foot.

ELEVATION.

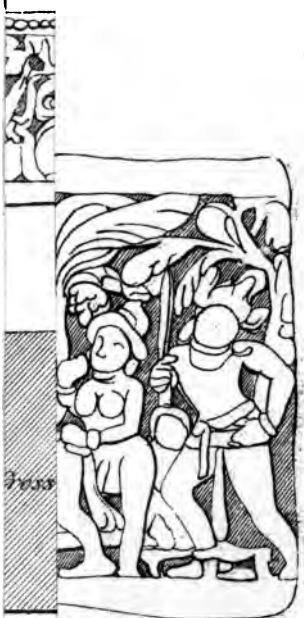
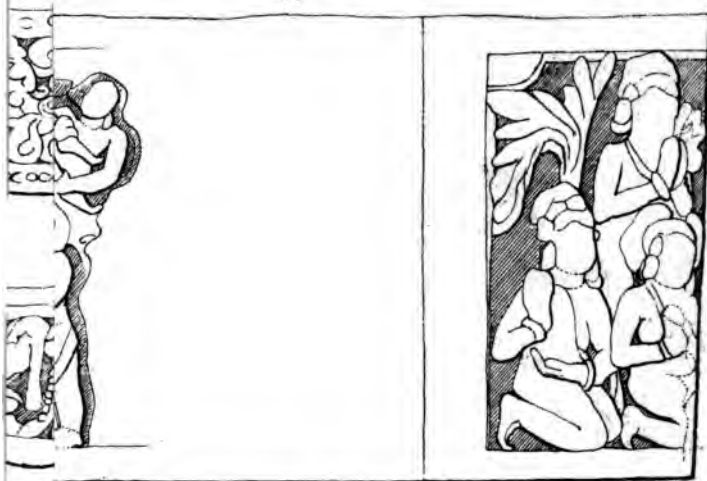


PLAN.





9.



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ART. VIII.—*On the Moon's Figure, Rotation, and Surface.* By
the Rev. JAMES GLASGOW, D.D.

Presented 10th October 1861.

You were, perhaps, too young to have paid much attention to a discussion, displaying more of vanity than science, which went the round of newspapers some four or five years ago.* The Moon's rotation was positively denied; and it was urged that, because she always keeps the same face next the earth, therefore she does not rotate; while the obvious and mathematically certain inference is, therefore she does rotate, though, as I propose to show, her rotation depends on a different cause from that of the earth. It was said the moon is fixed in relation to the earth, as if attached by a wire, or as if she were a part of the earth. But as every part of the earth rotates, so, if the moon were a part of the earth, she would share the earth's rotation. It was said this would constitute rotation about the earth's centre; but the word rotate properly applies only to a wheel-like motion within the body. The moon's rotation is round her own centre, which, however, is constantly shifting her position or describing the lunar orbit.

To show this,—let A (Pl. IV. fig. 1) be the centre of the earth, B that of the moon, and C that of the moon after she has revolved to some distance in her orbit. Produce AB , AC , to DE . Draw the tangent DH , which, after the revolution of the centre B to C , takes the position EG . Now, as the line AD revolves to AE , the diameter ID , being still directed to the earth, takes the position KE , and DF takes the position EG , which produced cuts DH in F . The moon therefore has rotated by the angle HFE , or the central angle A .

Among the questions which have been raised rather than settled by astronomers, one relates to the presence or absence of fluid matter as

* Some queries by this juvenile friend respecting the asteroids, became the immediate occasion of my putting into a written form my previous ideas, as referred to in p. 126. The first copy having been addressed and sent to him, the epistolary form, though perhaps not the most eligible, is retained. It scarcely appears afterwards, and affects not the mode of proof.

part of the moon's superficial mass. The telescopic observations of former times led astronomers to map out the disk of the moon, denominating the duskiest parts seas, and assigning them names. This was too hasty; but some later astronomers have been perhaps equally hasty in the opposite direction. They have asserted that the moon contains neither water nor air. The facts are that clouds do not appear, and that when the moon is about to cause an occultation of a star, no atmosphere is detected. But from these facts the true conclusion is no more than that the quantity of air is, if existent, not sufficient to be detected by present telescopic means. Its existence may appear improbable to some; but more cannot be scientifically alleged, and late astronomers are not unanimous in supposing so much. The telescopic observations of Schroter are thought by some of them to have proved the existence of a very rare atmosphere.

Perhaps none has gone nearer to a negation of fluids on the moon than Sir J. Herschel in his volume on Astronomy in Lardner's Cyclopædia. He says (p. 229), "what is, moreover, extremely singular in the geology of the moon is, that, although nothing having the character of seas can be traced, yet there are regions perfectly level, and apparently of a decidedly alluvial character. The moon has no clouds nor any other indications of an atmosphere. Were there any, it could not fail to be perceived in the occultation of stars, and the phenomena of solar eclipses." But in the same and next page, he asserts that decisive marks of volcanic stratification, arising from successive deposits of ejected matter, may be clearly traced with powerful telescopes." Now with volcanic action we usually associate ignition and combustion; and we know chemically, that the general supporter of these is oxygen; and, though chlorine may also support some combustion, as of metals, yet that equally with oxygen supposes an atmosphere of some gas or gases. It is also true that volcanoes, without ignition, as those of mud and water, are found on the earth; yet I must ask, what conception can we form of volcanic action, without any of those agents,—*fire, gases, or water*? But it is admitted on all hands that the surface of the moon is honeycombed with volcanoes which, if not now, were formerly active. The appearances attributed to fire are as strenuously explained away as those supposed to prove the presence of air. It is indeed correct to say an atmosphere may have formerly existed; but it is surely no absurd idea to suppose that some portion of it may yet remain. He also says (p. 231), "Whatever moisture may exist on its surface must be constantly transferred by distillation *in vacuo*, &c. The consequence must be absolute aridity below the vertical sun,

constant accretion of hoar-frost in the opposite region, and perhaps a narrow zone of running water at the borders of the enlightened hemisphere." So then, according to Sir J. Herschel, there may after all be water, and consequently oxygen,—an ingredient common to air and water,—the only question being that of quantity.

The following statements of Dr. Dick also merit attention (Chr. Phil. p. 283), "Certain luminous spots which have been occasionally seen, seem to demonstrate that fire exists in that planet.* Sir W. Herschel and several other astronomers suppose that they are volcanoes in a state of eruption. It appears highly probable, from the observations of Schroter, that the moon is encompassed with an atmosphere, but no clouds or rain or snow seem to exist in it. Also (Cel. Sem. p. 241): "It has been observed on different occasions that the moon in a solar eclipse was surrounded with a luminous ring, which was most brilliant on the side nearest the moon; that the sharp horns of the solar crescent have been blunted at their extremities during total darkness; that, preceding the emersion, a long, narrow streak of dusky light has been seen to colour the western limb of the moon,—and that the circular figure of Jupiter, Saturn, and the fixed stars has been changed into an elliptical one, when they approached either the dark or enlightened limb of the moon. The celebrated Schroter, of Lilienthal, discovered near the moon's cusps a faint grey light of a pyramidal form, extending from both cusps into the dark hemisphere, which, being the moon's twilight, must necessarily arise from its atmosphere. The following are the general conclusions:—that the inferior and more dense part of the moon's atmosphere is not more than 1,500 feet† (less than $\frac{1}{4}$ of an English mile) high; that the height of the atmosphere, where it could affect the brightness of a fixed star, or deflect the solar rays, does not exceed 5,742 feet. A fixed star will pass over this space in less than two seconds, and if it emerge at a part of the moon where there is a ridge of mountains (higher perhaps than such atmosphere), scarcely any observation can be perceptible." It is difficult to avoid the conclusion, unless the latest observations should have proved these totally

* Scientific friends having kindly furnished interesting remarks and facts, I shall make use of some of them. One, for instance, remarks that "the bright spots are believed to have been portions of the shining rays, or bright veins, that form so very remarkable a feature in selenology." But these are obviously luminous, else on the dark part of the moon they would be invisible. Do we know any luminosity on an opaque body without fire? To say "phosphoric" is of no avail, for that requires atmospheric air.

† A little more.

erroneous, which can scarcely be supposed. They are clearly in favour of the existence of an atmosphere very small in quantity, and to rough observation not perceptible.

But in determining the question of the possibility of *observing* fluids on this satellite, we must ascertain its *figure*. Even apart from this, it is unscientific to assert that such fluids do not exist, merely because they are not sufficient to come within observation. With Lord Rosse's great telescope a river would not be observable, even as a line, unless it were 60 feet broad. A lake within 60 feet diameter would not make a visible dot. In regions, such as some considerable districts in India, with only very small streams, water sufficient for irrigation is procurable from wells; and though the supply is kept up by the annual rains, yet, under different cosmical arrangements, the water might be perpetually restored to the land in invisibly condensed vapours or dew. And how know we that, without large masses of water in the moon, there may not be sufficient for the purposes of lunar life, animal and vegetable? The utmost science warrants us to do is, beyond observed facts, to leave the question open. We have no right indeed, without proof, to assert the existence of fluids, any more than geologists have to assert the existence of human fossils in particular strata, without producing any. In this case, the general opinion is that such fossils do not exist; but this rests not on the mere want of facts, which would only warrant doubt, but on the progress of civilization, language, learning, and history, especially the inspired, all seeming to assign a definite and not very remote origin to the human race.*

* Men are making strenuous endeavours to prove the greater antiquity of man, by producing, from the Egyptian mud deposit, and from drift in Europe, some rude specimens of art, which some of them by a verbal trick are calling "human remains;" while, if human, they should be called "human works." Animal remains are the fossilised bones of animals. In this manner lexicographers define the word *remains*. But, suppose it proved that these works of art are older than the human race, what follows? Obviously, that some other order of beings capable of producing them existed on earth, and passed away before our progenitor appeared. "Oh! then," some may say, as one once did: "You advance the theory of monkeys." I advance no theory, I merely show the flaw in the reasoning of those who assume that very ancient and very rude works of art must, of course, be human. For aught science can tell, demons or angels may have inhabited the earth in some era, and the arrow heads and the pottery may be their work. To discuss this question is no part of my present task. I only notice it for illustration. It is a question not for geologists, but for biblical translators and interpreters, whether the man mentioned in the first chapter of Genesis and the man mentioned in the second represent the same or different races. Let human fossils be produced *in situ*, and let the rock in which they are embedded be proved beyond debate to be more ancient than the human

In like manner, in regard to the question of fluids in the moon, unless such observations, as those of Schroter cited above, be sufficient to prove their existence, or new facts came to light, we cannot scientifically assert it. But as little can we scientifically deny it, unless observations have been such as no small quantity could in any circumstances elude. In such a case, all we have a right to say is, we do not know ;—just as previously to the invention of the microscope, men could not, without denying fact, have denied the existence of infusoria ; fact is fact, whether known or unknown ; but they could truly have asserted that the existence of these was unknown.

But may not fluids exist on the moon, even in large quantity, and yet elude terrestrial observation ? Attempts to establish this have been made. It was some time since announced that Professor Hausen, a Danish astronomer, had determined the moon's centre of gravity to be towards the side remote from the earth. Supposing this demonstrated, the inference at once is, that the fluids, being accumulated round the centre of gravity, are drawn to the further side of the moon, and not at all, or only a small portion of them, exposed to human view. In an out-station of India, I have no means of access to the paper of Hausen, nor the

period. Then, and then only, will believers in the recent origin of the human race have a case to consider. And let those innovators who assign a pre-Adamic origin to our race, and determine man to be the only rational being, bethink themselves how they will settle the controversy with an opposite class of innovators, who, instead of ignoring all rational beings of higher or lower order except Adamites, allege no less than some seventeen progenitors of so many independent races now walking the earth under the common designation of men.

To this a friend adds the following very suggestive fact : “ The conclusion from Horner's discovery of pottery is most untenable. The Nile, I have no doubt, from my own observations, shifts its bed not perhaps so rapidly as the Ganges, yet in a similar way. A few years ago a brick house stood high on the very brink of the Hoogly, and was deserted ; a part of it fell down into the river, which, however, approached no nearer, but threw up a bank to the level of the plain, and receded to a considerable distance. The Ganges does not make an annual deposit equal to that of the Nile ; yet if Mr. Horner will go to that old ruin, and bore on the east side of it, he will find bricks and broken pots 30 or 40 feet deep, indicating the peopling of the Sunderbunds 15,000 years at least.”

In like manner, the famous human skeletons of the Guadaloupe limestone prove nothing until the antiquity of the stone is definitively established. And when we are told of two human foot-prints in old red sandstone on the banks of the Mississippi, we cannot but ask, why are they not shown *in situ* ? and why only *two* ? And from a print given in a work before me I would ask, are they human ? I have looked at impressions of the soles of the feet of natives of this country, and find them different.

least idea of the nature of his reasoning.* But the statement that such a demonstration had been produced, and appeared to have stood uncontroverted, induced me to renew, and trace to results, some speculations I had made years before. Finding no satisfaction from astronomical works, I have been thrown on the first principles of celestial mechanism. I have thus been led step by step to the conclusion that—

The Moon is ovoidal, with the prolate axis permanently directed to the earth, or in the line of the moon's radius vector, the more oblate end remote from the earth, and the dynamical or oscillatory centre nearer that end. In explanation I may remark that I use the word axis here, not as an axis of rotation, for the idea of rotation enters not into the proposition, but in the same way as the word is used in Spherical Trigonometry and Conic Sections, to denote a diameter vertical to a given great circle, or the greatest and least diameters of an ellipse, and as the author of the last note has appropriately used the word. Ellipse and ellipsoid, though practically, are not mathematically exact. I therefore use the word ovoidal, though, under the dynamical law referred to in the demonstration, the figure is doubtless proximate to

* On this point, one of my friends referred to has favoured me with part of the requisite information: "Theoretical considerations lead to the conclusion, that the moon must either be ellipsoidal, with its major axis nearly parallel to the radius vector, or that its interior is heterogeneous (or both), and its centre of gravity not corresponding with its centre of figure. The first is not confirmed by observation, unless it has recently been so by the photographic labours of De la Rue, who has taken some careful stereoscopic views; and I have a sort of indistinct recollection of having heard that they tended to confirm the idea of an ellipsoidal figure. Hausen's propositions are:—

"1. *If the moon's centre of gravity and the centre of its figure do not coincide, then must all the co-efficients of the inequalities in mean longitude be multiplied by a constant factor, which is a function of the distance between the two centres projected on the radius vector. And, 2. If the centre of the moon be further removed from us than the centre of gravity, then is this factor less than unity; but if, on the contrary, the former be nearer to us than the latter, the factor will be greater than unity.*

"Airy's Greenwich Observations (1750-1850) show that the theoretical co-efficients must all be increased or, according to Hausen, multiplied by 1.0001544, in order to reconcile them with observation; which makes the distance of the centre of gravity behind that of figure to be 33.5055 English miles."

This, let me add, is quite a distinct inquiry from that which I institute; but it is all the more satisfactory when the results are found to harmonize. It shows inductively that the moon is not of uniform density, the denser matter being on the further side, and therefore the centre of gravity being towards that side, while I propose to investigate the moon's oscillation, in one particular, so as to show that, even if the density be uniform, the centre of oscillation is on the remoter side.

an ellipsoid, or more correctly, perhaps, prolate spheroid, since the oblate and the prolate spheroids or ellipsoids are equally related to the ellipse, the one being formed by its revolution round the minor, and the other round the major axis.

To prove the proposition, it might be sufficient for those intimately acquainted with mechanical philosophy to refer to the law of oscillation, and to exemplify in the fact that a body moving in a curve, as a carriage turning a corner, has the centre of gravity constant, yet a certain velocity will make it upset and fall outwards. In this case, the centrifugal or oscillatory force is concentrated in a centre more remote than the centre of gravity from the centre of motion. On the same principle, in the case of the moon, the earth is the centre of motion, and if the mass be uniform, the centre of a great circle or ellipse in the plane of the line joining the centres of the two bodies is the initial centre of gravity, that is, before it has acquired centrifugal force. But the centrifugal force gives it a centre of circular motion more remote than this centre of gravity. The mass of the moon being considered as concentrated in this centre, that mass balanced by the equal forces of terrestrial gravitation, and centrifugal or tangential force, has its orbital distance the radius vector, from which it cannot vary. But it is otherwise with molecules of that mass. Those on the side nearer the earth have a tendency to greater velocity, and therefore more of tangential force, than those on the remote side.

We must, to estimate this difference, consider the figure of the moon as produced by gravitation, and modified by centrifugal force; in other words, we must view it *statically* and *dynamically*.

1. *Statically*.—Let A (Fig. 2) be the earth's and B the moon's centre. Join AB , and produce it to E . Make CD perpendicular to AB . Supposing the moon primarily spherical, or of a form approaching sphericity, all the matter in the hemisphere CED , by gravitating towards the earth, would have a force additional to its lunar gravity and augmenting its weight. The matter, for example, at any point I would have its attraction to the earth's centre A , if represented by IK , resolved into the forces IJ and JK , of which IJ would give an impulse towards the earth, while JK would be so small as to be inappreciable in adding weight in the direction CB . The aggregate of such forces would combine with the moon's gravitation to increase the weight of all the matter in the hemisphere CED ; and thus the regions about E would become oblate, like those about the earth's poles. The contrary would take place in the hemisphere CFD , since the moon's own gravitation draws the matter towards B . Therefore the hemisphere CFD would become prolate to the

earth. Thus the moon, flattened at E and elevated at F , would tend to the ovoid form,—as the dotted curve. In such a form, the centre of gravity would be nearer E than F .

This may be more concisely expressed thus : at E the weight of a molecule is increased by the earth's attraction, and all the ordinates to CD in the hemisphere CED shortened, while at F the weight is diminished, and all the ordinates to CD in the hemisphere CED lengthened. The lunar gravitation in the direction CD , and DB , is not increased or diminished.

2. *Dynamically.*—Suppose the moon to be put in motion in its orbit, and suppose the part of it from E to F to be or become* firm or solid, as those who deny the existence of fluids in the moon allege her whole body to be. Consider now a molecule or mass of the matter at F and another at E as simultaneously beginning to move, *i. e.* to share in the moon's orbital motion. Both revolve round the centre of gravity of the earth and moon. But F is nearer to that centre than E , therefore (by Kepler's third law†), the mass F would, if free, move with greater velocity than the mass E . Being more powerfully attracted by the earth, it must do so, to produce a sufficient centrifugal force to balance the greater centripetal,—else it would fall to the earth. But, by hypothesis, it is not free, but fixed, as to distance from E . Its tendency to greater velocity must therefore add to the velocity of E , while E must retard it in like proportion ; and the resultant of both be in the centre of oscillation or orbital motion. Also F 's greater centrifugal force will give all its particles a tendency away from A , and towards E ; and this holds of particles on the surface on each side of F .

Now if, besides the firm matter making the distance FE a fixed quantity, there were also at F a quantity of fluid matter that would immediately obey its greater centrifugal force, which is not like the

* It has been suggested that "the hypothesis of plasticity or rigidity must be the same both for the dynamical and statical proof." But for the statical proof it is enough that the initial figure be spherical, whether by gravitation acting for a time on a plastic mass, or by the creative fiat. The same hypothesis as to being fluid or firm would only be necessary if applied to the same instant of time. The words "primarily spherical" refer to the form (in whatever way impressed) antecedent to the lunar revolution. At the instant when that begins, and not earlier (whether or not we suppose previous lapse of time in giving the sphericity), I can correctly start, as I do, my dynamical hypothesis of the body of the moon from F to E being of firm texture,—as it is admitted to be in fact,—in order to demonstrate the form and position which must be assumed by fluids, if existent on its surface.

† If t and t' be the times of revolution of two bodies, and d and d' their distances,—then $t^2 : t'^2 :: d^3 : d'^3$. Hence, the smaller the distance the smaller the time, and therefore the greater the velocity.

centrifugal force of the firm parts connected with the like force at *E*; and thus this fluid at *E* would seek equilibrium by flowing towards *E*, at which the fluid would rise to such level as to produce equilibrium. There would thus be, not a tide which fluctuates, but a constant conflux or elevation of fluid at *E*, while, though *F* be, as previously shown, elevated towards *A*, it is not with fluid but solid matter. Its tendency is in proportion to its intensity to counteract the statical force of the earth's attraction, and produce a somewhat nearer approximation to the spherical form. It may be thought that it should completely do so, since the centrifugal and centripetal forces are equal; but this equality is true only of the centre of gravity, not of the matter at the nearer and remoter sides of the moon.

This communication of the centrifugal force from *F* to *E* tends to remove the centre of oscillation nearer to *E* than the statical centre of gravity. If the moon were all fluid, the surface molecules at *F* would perpetually tend towards *E*, and tend to impel the molecules at *E* towards the centre; and in this case also an equilibrium would be produced. The matter in the nearer half of the moon would have a constant impulse towards *E*, and, according to this impulse, the fluid must seek equilibrium in that direction.

Thus the moon is in a state of stable equilibrium, with the hemisphere *CFD* always towards the earth. For, as the law of centrifugal force gives a tendency to protuberance on the moon's remoter half, so the centre of gravity lies nearest the aggregate of matter, according to the law of the centre of gravity. There are more molecules of matter beyond the bisection of the prolate axis than on the nearer side of it. If we conceive these aggregates balanced on the arms of a lever, the centre of figure, or even of gravity being fulcrum, the remoter arm, being loaded with the aggregate of oscillatory force, must be the shorter. Now, if the moon were only statically posited, it would tend to fall to the earth, and the centre of gravity would assume the maximum of nearness to the earth. The portion of its mass nearest the earth would tend to maintain that position as being most attracted. Thus the statical equilibrium would be stable; but this depends not on the position of the centre of gravity, and would hold equally whether the moon's density were uniform or not.* But the moon is actually moving in her orbit, or revolving round the earth's and her centre of

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gravity. The portion next the earth is lightest by virtue of the terrestrial deducted from the lunar gravitation on that side. It therefore has the least tendency to oscillate or recede from the earth ; while the centre of centrifugal force or oscillation gives stability on the distinct principle of a stone in a sling, or water in a tumbler, swung round one's head.

Thus, while the theory of unequal density, and the definite distance of the moon's centre of figure and gravity necessarily lead to the conclusion, that fluids, if existent on the moon, must be confluent on the remoter side, this theory alone will not account for the stable equilibrium. This I have shown to result from the oscillatory force. But it is most satisfactory to find the demonstration so decisively corroborated by the results of multiplied observations and laborious calculations. The determination of the *figure* from mere observation must be impracticable ; for it can scarcely be supposed that even the best photographic observation could show an ellipsoid seen in the line of its major axis, and of comparatively small eccentricity, to differ from a sphere. The case is different with observations on the moon's motions, such as those that have confirmed the theory.

In opposition to the conclusion now established, some objections may be started. Thus it may be said, the proof now offered does not take any account of the rotation of the moon. But the reply is easy and obvious. It shows the moon's stable equilibrium ; and that, by keeping the same face towards the earth, secures one rotation of the moon, in the same period with one revolution round the earth.

But may we not conceive the moon to have been endued with a rotation apart from this ? Yes, and more : we might conceive the centrifugal force produced by such rotation to overcome that equilibrium which is now stable, and to carry the moon round her axis of rotation with any given velocity. In such a case the satellite would not preserve the same side next the luminary. But if such supposed independent rotation were sufficiently small, it would be overcome by the force which now secures equilibrium. How much velocity of independent rotation would throw the satellite out of equilibrium might be subjected to mathematical calculation. But without facts to indicate such independent rotation, we ought not to assume it. And it could not continue without causing the moon to present different sides to the earth. The equilibrium, on the other hand, produces the moon's actual rotation.

It may be objected that this demonstration would prove too much ; for if valid, it would apply to other satellites equally with our moon.

But so it ought ; and in doing so, it corresponds with the generally received law of the satellites. They with few, if any exceptions, keep the same focus next their luminaries. Sir J. Herschel, after stating (p. 230) the fact of the same side of the moon being always toward us, adds: "This remarkable coincidence of two periods, which at first sight would seem perfectly distinct, is said to be a consequence of the general laws to be explained hereafter,"—*i.e.* of gravitation, centrifugal force, &c., which he explains in the next chapter. The satellites of Jupiter are subject to marked fluctuations, in respect of brightness, and these fluctuations happen periodically, according to their positions with respect to the sun. From this it has been concluded, apparently with reason, that they turn on their axes, like our moon, in times equal to their sidereal revolutions about their primaries." Again, when we compare these periods of sidereal revolutions in the nearer and more distant satellites, we find a corresponding result. The satellites nearest their primaries have the greatest velocities, and therefore the greatest power of preserving the equilibrium ; and they have also the shortest periodic times. Thus,—

Jupiter, 1st satellite,	periodic time,	1 day 18 hours.		
Ditto 4th	ditto	ditto	16 do.	16 ditto.
Saturn, 1st	ditto	ditto	0 do.	22 ditto.
Ditto 7th	ditto	ditto	79 do.	7 ditto.
Uranus 1st	ditto	ditto	0 do.	6 ditto.
Ditto 6th	ditto	ditto	107 do.	16 ditto.

It may be also objected that this demonstration is in one respect equally applicable to the earth as to the moon, since it does not involve the hypothesis of the one being smaller than the other, but simply of the two revolving about a common centre of gravity, or being a system ; and therefore, if it prove a stable equilibrium of the moon in relation to the earth, it must equally prove a stable equilibrium of the earth in relation to the moon. But the earth has not such equilibrium ; for it turns all its sides to the moon. The explanation, however, is obvious : the demonstration applies equally to both ; but, as already shown, the independent* rotation of either may be sufficient to overcome the equilibrium. In the case of the moon it is not so. In the case of the earth it is. And why? 1, Because the smaller planet has less power of preserving equilibrium in the larger than the larger in the

* By this word I mean simply not arising from orbital revolution. I require not to touch curious speculations about rotation arising from some causes, such as light or electricity.

smaller. 2, Because the moon's rotation is not one-hundredth part of that of the earth. It is $1:27.32 \times 3.7$ —i.e. the product of the moon's period and of the ratio of the earth's to the moon's circumference = $1:101.084$. Now, as the moon was not sufficient to produce the earth's rotation, which is of so much shorter a period, so it is far from sufficient to counteract it, and thereby reduce the earth to equilibrium. On the other hand, the moon's small independent rotation, even if supposed primarily a little more than the actual rotation is, would be easily overcome by the powerful attraction of the earth, so as to maintain her in a stable relation to the earth.

Why then do the primary planets not produce similar effects on one another? To this also the reply is obvious: the demonstration applies only to its hypothesis, which is that of two planets revolving round their common centre of gravity, not to that of two planets revolving round the centre of the solar system. It would in principle apply to the sun and a planet. Why then is not the same effect produced? The answer involves another fact, which is often adduced in explanation of the theory of opposite tides simultaneously on the earth. There are tides solar and lunar, but only the latter are popularly observed and known. Now, since the sun's attraction, notwithstanding his great distance, is much more powerful than that of the moon, why does he not produce higher tides? The answer usually given is true: the tide depends not on the amount of the attraction, but on the proportion of the attraction on the nearer to that on the remote side of the tidal planet. Now the earth's diameter has a much greater ratio to the moon's than to the sun's distance. Hence the greater difference of its attraction at F and E than of the sun's at G and H (fig. 2). As I have demonstrated the elevation at F , and, if there be fluid, its afflux at E , so the moon is constantly throwing the surface of our ocean into a form prolate at G and H , while the sun is producing small and scarcely observed (except when the solar and lunar tidal waves meet and constitute a spring-tide) prolations around other variable axes. The earth's powerful rotation is constantly overcoming this, and changing the position of the prolate axis; but the moon's feeble rotation being the result of its prolation, has no tendency to change it, while its centrifugal force, or force of revolution, is more powerful than that of the earth, and effectually gives the moon a permanent prolate form.

The difference of the earth's attraction at F and E is a distinct fact from that of which I have made use; but it furnishes an obvious ground of demonstration of the moon's prolate figure.

It may still be thought that, while I have shown the ovoid figure

of the moon, and found room for an ocean and atmosphere on her further hemisphere, these are of no importance without land as an abode of life. With their importance or use I have no concern in establishing the fact, though these may involve subsequent interesting and beautiful considerations. Though, as will be seen, I am distinctly favourable to the idea that at least the further side of the moon is inhabited, yet that idea is by no means essential to the question. It is perfectly rational with one of my scientific friends to think that the moon *may be* now in a state analogous to that of the earth during the formation of gneiss and mica. This is simply a speculation which cannot be proved nor can it be refuted, though I beg to say I think various probabilities tell against it; and if the metamorphic theory of Lyell be admitted, it is an open question whether the formations now named may not formerly have contained fossils; and whatever be said of that theory, it may still be a question whether the very earliest of these rocks, during their deposition in water, may not have teemed with infusoria, and such mollusks as unprovided with conchal, testaceous, or crustaceous covering would perish and leave no fossil behind. If we may not fully assert that the moon is an abode of life, I strongly submit that analogy to the geologic ages of the earth will not sustain the assertion that it is not. Meantime, let it be remembered that the protuberance of water in the further hemisphere, if existent, does not do away with the possibility or probability of land in that hemisphere. Though it provides for the presence there of all or the major part of the water in the moon, it does not exclude land. The firm surface of the moon is admitted on all hands to be very uneven; portions of it may stand above the level of the water; and thus, even in the watery hemisphere, there may be not only sea, but continents and islands, and all requisites for a teeming population, like us, dependent for life on air and water. Even the absence of land would form no valid objection to the belief in an abundant and even rational population. Rational beings might be constituted to find their habitat and comfort on the surface of the water, as a city in Siam is to a large extent built on rafts on the surface of a river. Such lunarians might find their food in vegetation on the surface of the sea, like sea-weeds that cover thousands of square miles of the Atlantic ocean, or from fish drawn from its depths. They may not be shivering wretches like us, obliged to seek clothing and houses. Theirs may be a constitution as much requiring a fortnight of cold and another of heat, as we require the activities of day and the repose of night, and their milder alternations. On the nearer hemisphere land may be the permanent abode of the population; while ships may be launching from

their shores, and ploughing the ocean to the opposite shores, or collecting valuable marine plants on its surface.

It is suggested that, though the moon may not be inhabited at present, "she may be in a geologic age not later than our earliest azoic rocks,—and how much earlier, who shall say?" This speculation is possible; and the analogy makes it not probable although plausible. Yet the analogy helps the advocates of the hypothesis only a little way. It is true that earlier than the post-tertiary period we find no well-ascertained traces of man, though some have been alleged; but how long the previous periods in which gigantic mammals and reptiles were abundant! Even down in the azoic rock, though we miss the obvious traces of life, we know not but incipient life in minute forms may have existed; and we know not but the metamorphic process may have obliterated traces once obvious. But if the moon be at present in an azoic state, that bears little, if any, analogy to the azoic state of the earth. The moon's crust as presented to us is eminently volcanic; it rather resembles the later trap-formations on the earth than the early gneiss and mica. But especially preparation for a race of inhabitants implies disintegration; and that again requires the action of air and water,—the very elements denied to the moon. Every telescopic view of her surface presents her ridges with a sharpness of outline, which indicates little, if any, disintegration or denudation. The hope of her becoming fit for population by such process must be indefinitely postponed.

I may add that while the words of Moses,—“the evening and the morning were one day,”—show us, what geologists also maintain, that the days are not mere divisions of time formed by one rotation which would make a night intervene between an evening and morning, but long periods; yet I think some writers speak too loosely of these periods as incalculable time, millions of ages, &c. Such words do not perhaps always follow a due consideration of the amount of a million. Hitchcock, who, in one or two instances uses such phrases, is probably as near sober truth, when he says (Section II.) that the formations within the human period may be about a five-hundredth part of the whole,—which would indicate a total of from three to four millions of years. But perhaps even a proximate estimate is not given to science.

I merely add a few corollaries from this investigation.

1. The moon's and the earth's rotation depend on different causes; the former on its equilibrium, the latter on its independent rotatory force. This has been stated, but requires not to be overlooked.

2. The moon cannot, according to the common idea of the word tide, be said to have any tide, aqueous or aerial. As her prolation is

fixed she has no tidal wave sweeping round her produced by the earth. This is not meant absolutely to deny the existence of anything of the nature of a tide, but only fluctuations, such as we express by the word. It is asked, "may not the great eccentricity of the moon's orbit cause a menstrual tide?" It may; and if air and water exist, it does to a minute extent. Assuming the presence of water, she has theoretically solar and tellurian tides modified by the vibrations in latitude and longitude. But the menstrual tide cannot shift its place, except by bringing the margin of the water a little nearer the earth at the time of perigee.

3. It has no aqueous or ærial currents produced by the earth's attraction, except such inconsiderable changes as may arise from the variable distance from the earth.

4. As the aqueous and atmospheric tides on earth are among the principal causes of the increase and diminution of heat in different parts of our atmosphere, and as these are continually producing winds and transferring clouds, so these agencies not existing on the moon, except in the slight degree specified, winds and transference of clouds either exist not at all, or in a very minor degree. They have never been observed on the nearer side; and so far as rotation is concerned, there is no cause to produce them; for the moon's rotation is not like that of the earth followed by a tidal wave. It keeps the whole body of the moon solid or fluid in a uniform relation to the earth. It is not surprising therefore that no clouds should appear on the moon. If they did appear, they would maintain one position, excepting from the very slight influence of the solar tides. What other minor causes of ærial currents, electric, volcanic, ethereal, &c. may exist in that orb itself, or in the feebler attractions of the remoter planets, come not within my inquiry. Possibly these may produce currents sufficient for order, beauty, life, and happiness, yet not sufficiently strong for man's optics and optical apparatus. All this may suggest the thought that the moon must be a world of profound tranquillity. Is it the tranquillity of a lifeless desert, or of homes of life, where jarring elements and more jarring passions never rage, and where the quietude sighed after by so many sublunary hearts is really enjoyed? Whether volcanoes do, as formerly, intercept this, may after all suggest that, like the sublunary, the lunar state may be a chequered one.*

* The following suggestive note is appended. Herschel's theory of evaporation *in vacuo* would modify the surface temperature. But if the moon is (geologic) ages younger than the earth, may the heat from the lunar interior not differ greatly from the terrestrial? or may the lunar materials not absorb more or reflect so little

least idea of the nature of his reasoning.* But the statement that such a demonstration had been produced, and appeared to have stood uncontroverted, induced me to renew, and trace to results, some speculations I had made years before. Finding no satisfaction from astronomical works, I have been thrown on the first principles of celestial mechanism. I have thus been led step by step to the conclusion that—

The Moon is ovoidal, with the prolate axis permanently directed to the earth, or in the line of the moon's radius vector, the more oblate end remote from the earth, and the dynamical or oscillatory centre nearer that end. In explanation I may remark that I use the word axis here, not as an axis of rotation, for the idea of rotation enters not into the proposition, but in the same way as the word is used in Spherical Trigonometry and Conic Sections, to denote a diameter vertical to a given great circle, or the greatest and least diameters of an ellipse, and as the author of the last note has appropriately used the word. Ellipse and ellipsoid, though practically, are not mathematically exact. I therefore use the word ovoidal, though, under the dynamical law referred to in the demonstration, the figure is doubtless proximate to

* On this point, one of my friends referred to has favoured me with part of the requisite information: "Theoretical considerations lead to the conclusion, that the moon must either be ellipsoidal, with its major axis nearly parallel to the radius vector, or that its interior is heterogeneous (or both), and its centre of gravity not corresponding with its centre of figure. The first is not confirmed by observation, unless it has recently been so by the photographic labours of De la Rue, who has taken some careful stereoscopic views; and I have a sort of indistinct recollection of having heard that they tended to confirm the idea of an ellipsoidal figure. Hausen's propositions are:—

"1. *If the moon's centre of gravity and the centre of its figure do not coincide, then must all the co-efficients of the inequalities in mean longitude be multiplied by a constant factor, which is a function of the distance between the two centres projected on the radius vector. And, 2. If the centre of the moon be further removed from us than the centre of gravity, then is this factor less than unity; but if, on the contrary, the former be nearer to us than the latter, the factor will be greater than unity.*

"Airy's Greenwich Observations (1750-1850) show that the theoretical co-efficients must all be increased or, according to Hausen, multiplied by 1.0001544, in order to reconcile them with observation; which makes the distance of the centre of gravity behind that of figure to be 33.5053 English miles."

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To prove the proposition, it might be sufficient for those intimately acquainted with mechanical philosophy to refer to the law of oscillation, and to exemplify in the fact that a body moving in a curve, as a carriage turning a corner, has the centre of gravity constant, yet a certain velocity will make it upset and fall outwards. In this case, the centrifugal or oscillatory force is concentrated in a centre more remote than the centre of gravity from the centre of motion. On the same principle, in the case of the moon, the earth is the centre of motion, and if the mass be uniform, the centre of a great circle or ellipse in the plane of the line joining the centres of the two bodies is the initial centre of gravity, that is, before it has acquired centrifugal force. But the centrifugal force gives it a centre of circular motion more remote than this centre of gravity. The mass of the moon being considered as concentrated in this centre, that mass balanced by the equal forces of terrestrial gravitation, and centrifugal or tangential force, has its orbital distance the radius vector, from which it cannot vary. But it is otherwise with molecules of that mass. Those on the side nearer the earth have a tendency to greater velocity, and therefore more of tangential force, than those on the remote side.

We must, to estimate this difference, consider the figure of the moon as produced by gravitation, and modified by centrifugal force; in other words, we must view it *statically* and *dynamically*.

1. *Statically*.—Let A (Fig. 2) be the earth's and B the moon's centre. Join AB , and produce it to E . Make CD perpendicular to AB . Supposing the moon primarily spherical, or of a form approaching sphericity, all the matter in the hemisphere CED , by gravitating towards the earth, would have a force additional to its lunar gravity and augmenting its weight. The matter, for example, at any point I would have its attraction to the earth's centre A , if represented by IK , resolved into the forces IJ and JK , of which IJ would give an impulse towards the earth, while JK would be so small as to be inappreciable in adding weight in the direction CB . The aggregate of such forces would combine with the moon's gravitation to increase the weight of all the matter in the hemisphere CED ; and thus the regions about E would become oblate, like those about the earth's poles. The contrary would take place in the hemisphere CFD , since the moon's own gravitation draws the matter towards B . Therefore the hemisphere CFD would become prolate to the

earth. Thus the moon, flattened at *E* and elevated at *F*, would tend to the ovoid form,—as the dotted curve. In such a form, the centre of gravity would be nearer *E* than *F*.

This may be more concisely expressed thus : at *x* the weight of a molecule is increased by the earth's attraction, and all the ordinates to *CD* in the hemisphere *CED* shortened, while at *z* the weight is diminished, and all the ordinates to *CD* in the hemisphere *CED* lengthened. The lunar gravitation in the direction *CB*, and *DB*. is not increased or diminished.

2. *Dynamically*.—Suppose the moon to be put in motion in its orbit, and suppose the part of it from *E* to *F* to be or become* firm or solid, as those who deny the existence of fluids in the moon allege her whole body to be. Consider now a molecule or mass of the matter at *F* and another at *E* as simultaneously beginning to move, *i. e.* to share in the moon's orbital motion. Both revolve round the centre of gravity of the earth and moon. But *F* is nearer to that centre than *E*, therefore (by Kepler's third law†), the mass *F* would, if free, move with greater velocity than the mass *E*. Being more powerfully attracted by the earth, it must do so, to produce a sufficient centrifugal force to balance the greater centripetal,—else it would fall to the earth. But, by hypothesis, it is not free, but fixed, as to distance from *E*. Its tendency to greater velocity must therefore add to the velocity of *E*, while *E* must retard it in like proportion ; and the resultant of both be in the centre of oscillation or orbital motion. Also *F*'s greater centrifugal force will give all its particles a tendency away from *A*, and towards *E* ; and this holds of particles on the surface on each side of *F*.

Now if, besides the firm matter making the distance *FE* a fixed quantity, there were also at *F* a quantity of fluid matter that would immediately obey its greater centrifugal force, which is not like the

* It has been suggested that "the hypothesis of plasticity or rigidity must be the same both for the dynamical and statical proof." But for the statical proof it is enough that the initial figure *be* spherical, whether by gravitation acting for a time on a plastic mass, or by the creative fiat. The same hypothesis as to being fluid or firm would only be necessary if applied to the same instant of time. The words "primarily spherical" refer to the form (in whatever way impressed) antecedent to the lunar revolution. At the instant when that begins, and not earlier (whether or not we suppose previous lapse of time in giving the sphericity), I can correctly start, as I do, my dynamical hypothesis of the body of the moon from *F* to *E* being of firm texture,—as it is admitted to be in fact,—in order to demonstrate the form and position which must be assumed by fluids, if existent on its surface.

† If *t* and *t'* be the times of revolution of two bodies, and *d* and *d'* their distances,—then $t^2 : t'^2 :: d^3 : d'^3$. Hence, the smaller the distance the smaller the time, and therefore the greater the velocity.

centrifugal force of the firm parts connected with the like force at *E*; and thus this fluid at *E* would seek equilibrium by flowing towards *E*, at which the fluid would rise to such level as to produce equilibrium. There would thus be, not a tide which fluctuates, but a constant conflux or elevation of fluid at *E*, while, though *F* be, as previously shown, elevated towards *A*, it is not with fluid but solid matter. Its tendency is in proportion to its intensity to counteract the statical force of the earth's attraction, and produce a somewhat nearer approximation to the spherical form. It may be thought that it should completely do so, since the centrifugal and centripetal forces are equal; but this equality is true only of the centre of gravity, not of the matter at the nearer and remoter sides of the moon.

This communication of the centrifugal force from *F* to *E* tends to remove the centre of oscillation nearer to *E* than the statical centre of gravity. If the moon were all fluid, the surface molecules at *F* would perpetually tend towards *E*, and tend to impel the molecules at *E* towards the centre; and in this case also an equilibrium would be produced. The matter in the nearer half of the moon would have a constant impulse towards *E*, and, according to this impulse, the fluid must seek equilibrium in that direction.

Thus the moon is in a state of stable equilibrium, with the hemisphere *CFD* always towards the earth. For, as the law of centrifugal force gives a tendency to protuberance on the moon's remoter half, so the centre of gravity lies nearest the aggregate of matter, according to the law of the centre of gravity. There are more molecules of matter beyond the bisection of the prolate axis than on the nearer side of it. If we conceive these aggregates balanced on the arms of a lever, the centre of figure, or even of gravity being fulcrum, the remoter arm, being loaded with the aggregate of oscillatory force, must be the shorter. Now, if the moon were only statically posited, it would tend to fall to the earth, and the centre of gravity would assume the maximum of nearness to the earth. The portion of its mass nearest the earth would tend to maintain that position as being most attracted. Thus the statical equilibrium would be stable; but this depends not on the position of the centre of gravity, and would hold equally whether the moon's density were uniform or not.* But the moon is actually moving in her orbit, or revolving round the earth's and her centre of

* This is different from the consideration of the centre of gravity of a body on the earth's surface, because in the latter case no account is taken of the gravitation of the parts of the body towards one another. The aggregate of gravitation to the earth is considered as united in the centre of gravity.

gravity. The portion next the earth is lightest by virtue of the terrestrial deducted from the lunar gravitation on that side. It therefore has the least tendency to oscillate or recede from the earth ; while the centre of centrifugal force or oscillation gives stability on the distinct principle of a stone in a sling, or water in a tumbler, swung round one's head.

Thus, while the theory of unequal density, and the definite distance of the moon's centre of figure and gravity necessarily lead to the conclusion, that fluids, if existent on the moon, must be confluent on the remoter side, this theory alone will not account for the stable equilibrium. This I have shown to result from the oscillatory force. But it is most satisfactory to find the demonstration so decisively corroborated by the results of multiplied observations and laborious calculations. The determination of the *figure* from mere observation must be impracticable ; for it can scarcely be supposed that even the best photographic observation could show an ellipsoid seen in the line of its major axis, and of comparatively small eccentricity, to differ from a sphere. The case is different with observations on the moon's motions, such as those that have confirmed the theory.

In opposition to the conclusion now established, some objections may be started. Thus it may be said, the proof now offered does not take any account of the rotation of the moon. But the reply is easy and obvious. It shows the moon's stable equilibrium ; and that, by keeping the same face towards the earth, secures one rotation of the moon, in the same period with one revolution round the earth.

But may we not conceive the moon to have been endued with a rotation apart from this ? Yes, and more : we might conceive the centrifugal force produced by such rotation to overcome that equilibrium which is now stable, and to carry the moon round her axis of rotation with any given velocity. In such a case the satellite would not preserve the same side next the luminary. But if such supposed independent rotation were sufficiently small, it would be overcome by the force which now secures equilibrium. How much velocity of independent rotation would throw the satellite out of equilibrium might be subjected to mathematical calculation. But without facts to indicate such independent rotation, we ought not to assume it. And it could not continue without causing the moon to present different sides to the earth. The equilibrium, on the other hand, produces the moon's actual rotation.

It may be objected that this demonstration would prove too much ; for if valid, it would apply to other satellites equally with our moon.

But so it ought ; and in doing so, it corresponds with the generally received law of the satellites. They with few, if any exceptions, keep the same focus next their luminaries. Sir J. Herschel, after stating (p. 230) the fact of the same side of the moon being always toward us, adds: "This remarkable coincidence of two periods, which at first sight would seem perfectly distinct, is said to be a consequence of the general laws to be explained hereafter,"—*i.e.* of gravitation, centrifugal force, &c., which he explains in the next chapter. The satellites of Jupiter are subject to marked fluctuations, in respect of brightness, and these fluctuations happen periodically, according to their positions with respect to the sun. From this it has been concluded, apparently with reason, that they turn on their axes, like our moon, in times equal to their sidereal revolutions about their primaries." Again, when we compare these periods of sidereal revolutions in the nearer and more distant satellites, we find a corresponding result. The satellites nearest their primaries have the greatest velocities, and therefore the greatest power of preserving the equilibrium ; and they have also the shortest periodic times. Thus,—

Jupiter, 1st satellite,	periodic time,	1 day 18 hours.		
Ditto 4th	ditto	ditto	16 do.	16 ditto.
Saturn, 1st	ditto	ditto	0 do.	22 ditto.
Ditto 7th	ditto	ditto	79 do.	7 ditto.
Uranus 1st	ditto	ditto	0 do.	6 ditto.
Ditto 6th	ditto	ditto	107 do.	16 ditto.

It may be also objected that this demonstration is in one respect equally applicable to the earth as to the moon, since it does not involve the hypothesis of the one being smaller than the other, but simply of the two revolving about a common centre of gravity, or being a system ; and therefore, if it prove a stable equilibrium of the moon in relation to the earth, it must equally prove a stable equilibrium of the earth in relation to the moon. But the earth has not such equilibrium ; for it turns all its sides to the moon. The explanation, however, is obvious : the demonstration applies equally to both ; but, as already shown, the independent* rotation of either may be sufficient to overcome the equilibrium. In the case of the moon it is not so. In the case of the earth it is. And why? 1, Because the smaller planet has less power of preserving equilibrium in the larger than the larger in the

* By this word I mean simply not arising from orbital revolution. I require not to touch curious speculations about rotation arising from some causes, such as light or electricity.

smaller. 2, Because the moon's rotation is not one-hundredth part of that of the earth. It is $1:27.32 \times 3.7$ —i.e. the product of the moon's period and of the ratio of the earth's to the moon's circumference = $1:101.084$. Now, as the moon was not sufficient to produce the earth's rotation, which is of so much shorter a period, so it is far from sufficient to counteract it, and thereby reduce the earth to equilibrium. On the other hand, the moon's small independent rotation, even if supposed primarily a little more than the actual rotation is, would be easily overcome by the powerful attraction of the earth, so as to maintain her in a stable relation to the earth.

Why then do the primary planets not produce similar effects on one another? To this also the reply is obvious: the demonstration applies only to its hypothesis, which is that of two planets revolving round their common centre of gravity, not to that of two planets revolving round the centre of the solar system. It would in principle apply to the sun and a planet. Why then is not the same effect produced? The answer involves another fact, which is often adduced in explanation of the theory of opposite tides simultaneously on the earth. There are tides solar and lunar, but only the latter are popularly observed and known. Now, since the sun's attraction, notwithstanding his great distance, is much more powerful than that of the moon, why does he not produce higher tides? The answer usually given is true: the tide depends not on the amount of the attraction, but on the proportion of the attraction on the nearer to that on the remote side of the tidal planet. Now the earth's diameter has a much greater ratio to the moon's than to the sun's distance. Hence the greater difference of its attraction at F and E than of the sun's at G and H (fig. 2). As I have demonstrated the elevation at F, and, if there be fluid, its afflux at E, so the moon is constantly throwing the surface of our ocean into a form prolate at G and H, while the sun is producing small and scarcely observed (except when the solar and lunar tidal waves meet and constitute a spring-tide) prolations around other variable axes. The earth's powerful rotation is constantly overcoming this, and changing the position of the prolate axis; but the moon's feeble rotation being the result of its prolation, has no tendency to change it, while its centrifugal force, or force of revolution, is more powerful than that of the earth, and effectually gives the moon a permanent prolate form.

The difference of the earth's attraction at F and E is a distinct fact from that of which I have made use; but it furnishes an obvious ground of demonstration of the moon's prolate figure.

It may still be thought that, while I have shown the ovoid figure

of the moon, and found room for an ocean and atmosphere on her further hemisphere, these are of no importance without land as an abode of life. With their importance or use I have no concern in establishing the fact, though these may involve subsequent interesting and beautiful considerations. Though, as will be seen, I am distinctly favourable to the idea that at least the further side of the moon is inhabited, yet that idea is by no means essential to the question. It is perfectly rational with one of my scientific friends to think that the moon *may be* now in a state analogous to that of the earth during the formation of gneiss and mica. This is simply a speculation which cannot be proved nor can it be refuted, though I beg to say I think various probabilities tell against it; and if the metamorphic theory of Lyell be admitted, it is an open question whether the formations now named may not formerly have contained fossils; and whatever be said of that theory, it may still be a question whether the very earliest of these rocks, during their deposition in water, may not have teemed with infusoria, and such mollusks as unprovided with conchal, testaceous, or crustaceous covering would perish and leave no fossil behind. If we may not fully assert that the moon is an abode of life, I strongly submit that analogy to the geologic ages of the earth will not sustain the assertion that it is not. Meantime, let it be remembered that the protuberance of water in the further hemisphere, if existent, does not do away with the possibility or probability of land in that hemisphere. Though it provides for the presence there of all or the major part of the water in the moon, it does not exclude land. The firm surface of the moon is admitted on all hands to be very uneven; portions of it may stand above the level of the water; and thus, even in the watery hemisphere, there may be not only sea, but continents and islands, and all requisites for a teeming population, like us, dependent for life on air and water. Even the absence of land would form no valid objection to the belief in an abundant and even rational population. Rational beings might be constituted to find their habitat and comfort on the surface of the water, as a city in Siam is to a large extent built on rafts on the surface of a river. Such lunarians might find their food in vegetation on the surface of the sea, like sea-weeds that cover thousands of square miles of the Atlantic ocean, or from fish drawn from its depths. They may not be shivering wretches like us, obliged to seek clothing and houses. Theirs may be a constitution as much requiring a fortnight of cold and another of heat, as we require the activities of day and the repose of night, and their milder alternations. On the nearer hemisphere land may be the permanent abode of the population; while ships may be launching from

their shores, and ploughing the ocean to the opposite shores, or collecting valuable marine plants on its surface.

It is suggested that, though the moon may not be inhabited at present, "she may be in a geologic age not later than our earliest azoic rocks,—and how much earlier, who shall say?" This speculation is possible; and the analogy makes it not probable although plausible. Yet the analogy helps the advocates of the hypothesis only a little way. It is true that earlier than the post-tertiary period we find no well-ascertained traces of man, though some have been alleged; but how long the previous periods in which gigantic mammals and reptiles were abundant! Even down in the azoic rock, though we miss the obvious traces of life, we know not but incipient life in minute forms may have existed; and we know not but the metamorphic process may have obliterated traces once obvious. But if the moon be at present in an azoic state, that bears little, if any, analogy to the azoic state of the earth. The moon's crust as presented to us is eminently volcanic; it rather resembles the later trap-formations on the earth than the early gneiss and mica. But especially preparation for a race of inhabitants implies disintegration; and that again requires the action of air and water,—the very elements denied to the moon. Every telescopic view of her surface presents her ridges with a sharpness of outline, which indicates little, if any, disintegration or denudation. The hope of her becoming fit for population by such process must be indefinitely postponed.

I may add that while the words of Moses,—“the evening and the morning were one day,”—show us, what geologists also maintain, that the days are not mere divisions of time formed by one rotation which would make a night intervene between an evening and morning, but long periods; yet I think some writers speak too loosely of these periods as incalculable time, millions of ages, &c. Such words do not perhaps always follow a due consideration of the amount of a million. Hitchcock, who, in one or two instances uses such phrases, is probably as near sober truth, when he says (Section II.) that the formations within the human period may be about a five-hundredth part of the whole,—which would indicate a total of from three to four millions of years. But perhaps even a proximate estimate is not given to science.

I merely add a few corollaries from this investigation.

1. The moon's and the earth's rotation depend on different causes; the former on its equilibrium, the latter on its independent rotatory force. This has been stated, but requires not to be overlooked.

2. The moon cannot, according to the common idea of the word tide, be said to have any tide, aqueous or aerial. As her prolation is

fixed she has no tidal wave sweeping round her produced by the earth. This is not meant absolutely to deny the existence of anything of the nature of a tide, but only fluctuations, such as we express by the word. It is asked, "may not the great eccentricity of the moon's orbit cause a menstrual tide?" It may; and if air and water exist, it does to a minute extent. Assuming the presence of water, she has theoretically solar and tellurian tides modified by the vibrations in latitude and longitude. But the menstrual tide cannot shift its place, except by bringing the margin of the water a little nearer the earth at the time of perigee.

3. It has no aqueous or ærial currents produced by the earth's attraction, except such inconsiderable changes as may arise from the variable distance from the earth.

4. As the aqueous and atmospheric tides on earth are among the principal causes of the increase and diminution of heat in different parts of our atmosphere, and as these are continually producing winds and transferring clouds, so these agencies not existing on the moon, except in the slight degree specified, winds and transference of clouds either exist not at all, or in a very minor degree. They have never been observed on the nearer side; and so far as rotation is concerned, there is no cause to produce them; for the moon's rotation is not like that of the earth followed by a tidal wave. It keeps the whole body of the moon solid or fluid in a uniform relation to the earth. It is not surprising therefore that no clouds should appear on the moon. If they did appear, they would maintain one position, excepting from the very slight influence of the solar tides. What other minor causes of ærial currents, electric, volcanic, ethereal, &c. may exist in that orb itself, or in the feebler attractions of the remoter planets, come not within my inquiry. Possibly these may produce currents sufficient for order, beauty, life, and happiness, yet not sufficiently strong for man's optics and optical apparatus. All this may suggest the thought that the moon must be a world of profound tranquillity. Is it the tranquillity of a lifeless desert, or of homes of life, where jarring elements and more jarring passions never rage, and where the quietude sighed after by so many sublunary hearts is really enjoyed? Whether volcanoes do, as formerly, intercept this, may after all suggest that, like the sublunary, the lunar state may be a chequered one.*

* The following suggestive note is appended. Herschel's theory of evaporation *in vacuo* would modify the surface temperature. But if the moon is (geologic) ages younger than the earth, may the heat from the lunar interior not differ greatly from the terrestrial? or may the lunar materials not absorb more or reflect so little

5. On the nearer side of the moon, air and water are either very small in quantity or exist not at all. The former would seem the more probable. Let E (Figs. 3, 4) be a point of observation on the earth's surface, and c the moon's centre of gravity. Then an ovoid $DFGH$ (Fig. 3), or DKH (Fig. 4), will represent the fluid in the moon. Draw tangents EL , EM , to the firm body of the moon. Then if, as in Fig. 3, any part of the fluid lie nearer E than L and M do, or exterior to the angle at E , such portion as the segments FD , DH , HG , should be visible to an observer at E . But if, as in Fig. 4, all the fluid lies beyond the points LM , or within the tangents, no part of such fluid would be visible from E . We may conceive the moon's centrifugal force sufficient to determine the greater part of the fluids around c , and to leave, as in Fig. 3, a very shallow stratum of air and water on the surface from L to M . Or we may conceive, as in Fig. 4, the centrifugal force sufficient to carry the whole beyond the sphere of vision of an observer at E . In the former case, the moon would possess on the nearer hemisphere a very rare atmosphere, merely sufficient to produce the phenomena observed by Schroter. In the latter case, no atmosphere or water would be discoverable. As there seems no reason to question Schroter's observations, the former seems to have a fair claim on our assent.

The moon's radius vector varies, the orbit being elliptical. Hence the earth's attraction on her varies. When the moon is nearest the earth, the difference of the earth's attraction on the nearer and remoter sides is a maximum. It is therefore possible some of the moon's atmosphere may appear round the visible rim at one time and not at another,—which goes to reconcile apparently discordant observations.

Again, suppose NLM , (Fig. 5) a section of the moon, as in Fig. 3, perpendicular to the axis Ek , and passing through L and M . In this case, a slender circle of fluid around the moon's disk should be discoverable by an observer at E . This fluid might indeed be of so little depth as to escape observation. But it is, I think, a question whether or not it is observed without being recognized. For the outer rim or horizon of the disk presents a smooth unbroken circle, while the inner is jagged and uneven (even the naked eye can see this), on account of the sunlight at rising and setting slanting along the mountain tops. It is said the human observer, looking in lines tangential to the moon's surface, sees mountain tops so numerous as to fill up the interstices, and pre-

of the solar heat as to modify the heat on its surface? Both are possible; but such evaporation requires water to be evaporated. And such modification of the heat may be among the conditions favourable to animate and vegetable existence.

Fig. 1.

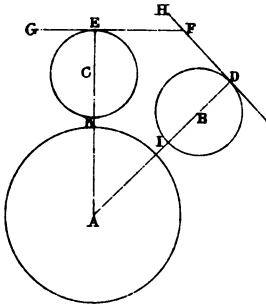


Fig. 2.

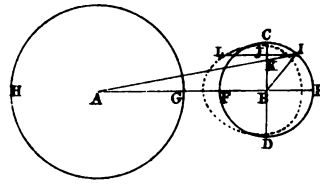


Fig. 3.

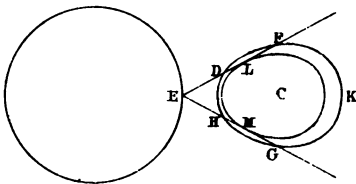


Fig. 4.

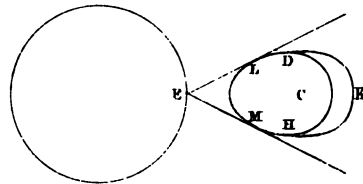


Fig. 5.

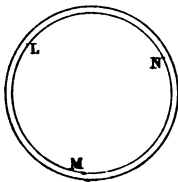
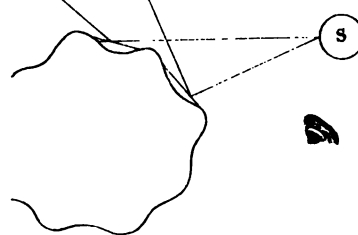


Fig. 6.



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sent a perfect circular surface, as the eye, looking along the surface of a sea broken by innumerable waves, sees a smooth horizon. In a general sense the watery horizon is smooth; but I have, in numerous cases far out at sea, seen a point of a wave occasionally break the circle of the horizon. So we might expect that on the moon, an occasional higher peak, or a slight break would appear. A peak of 60 feet extra height would be detected; and a gap of 60 feet would not escape notice,—especially as, with the exception of the moon's vibrations, the same scenery around the rim of the visible is always exposed to view. If at that portion of the moon there be merely water enough to fill the valleys, the complete circularity of the horizon is secured.*

6. The near and the remote hemisphere of the moon may be very unequal abodes of life; and if abodes of life at all, they must be very unequal. If the air and water on the nearer side be very small in quantity, they may not be sufficient to sustain the lives of creatures who may exist in health at the other side; while creatures, with constitutions fitted for the rare atmosphere and scanty water of the nearer side, may be incapable of existing on the further side. An analogous distinction of modes of life we have on the earth from a different cause. Land animals perish in the sea, while fish cannot subsist on the land. To our conceptions the nearer side of the moon must be as uninhabitable as the earth's polar regions to us. Or it may be as great an adventure for a lunarian of the remote hemisphere to visit the nearer one, as the polar adventures of Parry, McClintock, &c., or the highest ascent to a rare atmosphere in a balloon.

7. If the atmosphere on the nearer side be too rare to support life, and there be not life otherwise sustained, then the lunarians are all located on the further hemisphere. In that case, they are completely removed from our view, and the earth and its inhabitants shut out from theirs. We may conceive arduous journeys of some hundreds of miles undertaken (which to beings proportioned to their orb as we to ours,

* Here a scientific friend has suggested that "the light would be reflected by the surface of the water away from the eye, and therefore the water be imperceptible." This he illustrates as in Fig. 6. But to contemplate it aright, we should compare it with the terrestrial ocean, which certainly presents a *visible* circular horizon. He admits that, if the moon were all water, it would be visible though dim, but with a brilliant spot, reflecting the sun's direct rays, and that it would cause an occultation. This is true so far as the surface would present an unbroken mirror. But water, though a reflector, scatters many rays, especially when in the least ruffled. Of the visibility of water every one's visual organs may inform him. I lately stood with my face to a river, the moon behind me, and her rays, of course, reflected away from me; yet that water appeared a brilliant expanse of glass.

would be a journey four times as great as on the earth) to reach the limit at which a glance at the earth may be obtained; and we may conceive learned societies having observatories erected on some mountain peaks, barely within view of the earth. Or we may conceive the atmosphere insufficient to permit even a glance at their tellurian neighbour. In this case, they must be ignorant of the earth's existence, and they may have theories about some attraction of which they cannot discover the source.

8. Even if the force producing the moon's equilibrium be sufficient to carry the air and water entirely to the further side, we cannot certainly or scientifically conclude that the nearer side is a desert, but only that it *may* be so. Air and water are indeed necessary to such life, animal and vegetable, as we know; but we know not whether there may be plants and animals created to exist independently of these elements, and to depend on others, as heat, light, electricity, ether, and perhaps others that come not within our scientific technology. If so, the aquatic and aerial, and the non-aquatic and non-aerial may be as distinct in habitation and modes of life as the land and water animals on earth. These elements enter into our bodies; but we derive not our oxygen from water, nor require we gills like fish to separate globules of air from that fluid. As little may the lunarians of the nearer hemisphere require lungs to extract oxygen from air. Animalculæ and some larger types of life are discovered in situations where life might seem impossible. It would be most inconclusive reasoning then to infer that no life can exist except of the same type with ours.*

* The rugged surface of the moon is thus pointedly urged as a difficulty: "she presents on the face next us such a terrible chaos, such a honeycombed surface, with cells so horribly deep and dark, that, unless the inhabitants had all wings as well as an atmosphere of considerable density, I do not see how they could have any communication with each other. The whole tendency of later lunar discovery has been to dispel the idea of lunar inhabitants on this side." This is conclusive against the existence on the nearer side, of animals with bodies such as ours. But who is so absurd as to suppose that the inhabitants of different planets must have precisely the same kind of bodies? Professor Owen makes the incomplete development of the vertebral column in this world an argument for the extension of the general plan into other worlds (see McCosh and Dickie's *Typ. Forms and Sp. Ends*). Many animals in this world have wings; and surely there is no difficulty in supposing the same possible or probable in the moon or any planet. And if the atmosphere be rare, equally rare may be their bodies,—as rare as a gossamer or soap-bubble, yet full of life and radiant with happiness. Or, as magnetic and other imponderable and non-gravitating agencies exist on the earth, may not some of these constitute a *vis viva* on the moon? How know we that the bodies of animals there may not, like the torpedo, have an organization producing electric currents at will, and thus

I shall not impel fancy so far as to supply them with air-receptacles, analogous to the water-stomachs of camels, fitted to oxygenize them for weeks or months, and with bird-like or wind-like locomotive powers enabling them to glide round to the quarters on the other disk as often as requisite.

9. In such a case, if the lunarians of the two hemispheres hold communication, they can do it only by being able in some way to cross the border,—to come so far as to meet on neutral ground,—the shore of the water, or verge of the land covered with atmosphere. As atmosphere is elastic, we cannot easily conceive of it as having a shore, or a surface like water. On this ground, as well as those previously stated, I much incline to the alternative that, on the nearer side of the moon, air is not utterly wanting, but only much rarefied. Even where its equilibrium would determine it away from the earth, its elasticity may to some extent diffuse it over a wider surface. The question, then, of intercourse between the two hemispheres may be, to what extent the inhabitants of the one could bear a denser, and the other a rarer atmosphere.

10. The question of the moon's population is very variously estimated in the light of probability. Probability consists of numerous degrees. An hypothesis may rank so low in the scale of probability as to command no credence; another so high as to gain universal assent. Many facts only probable are universally believed. Suppose the hypothesis of life in the central depths of the earth,—it is not impossible, yet so little probable, or rather utterly improbable, that perhaps no one believes it. Suppose again the question, whether the earth is a shell or a solid globe; the probability of the latter is so high, that only some dreaming theorist doubts it. Now the number of probabilities in favour of the moon's being inhabited is such, that it may very reasonably gain assent. The analogies to the present earth are so many on the one side, against the one analogy to the geologic earth on the other,

possess a power of locomotion perhaps rivalling our lightning messages? Or may not the Creator have endued the mind, within suitable limits, with a motive power over the whole body, as ours has on a limb, not less mysterious than the other? On the moon's nearer hemisphere there may be both elements and laws which we know not. It is not improbable that we, while immersed in our atmosphere, cannot discover all the properties, even of such agencies as we know.

And is telescopic discovery to credit or discredit the question of population? The most powerful telescope can only show, as a speck, an object of 60 feet diameter while the crania of lunarians may only measure a couple of inches. The jagged cliffs and cavernous depths may all be clothed in beauty, and, as suggested above by a friend, equalizing influences may furnish a mild and genial climate.

that even the total want of air, if proved, which it never can be, should not destroy belief on the point. Such doubts are similar to the ancient opinion that the southern regions of the earth were so torrid as to be uninhabitable. These probabilities apply to the nearer side of the moon, though less fully than to the remoter side.

11. The remoter side is shut out from human view ;—that fact we have found to follow from the law of the moon's motion, and it is seen from common observation. If the inhabitants of that side can come into a position from which they may see the earth at all, they will see the whole surface of it rotate before them in 24 hours. But the further side of the moon we can never see. If telescopes, instead of showing objects 60 feet in diameter, should be brought to a power of showing objects one foot, still the moon shows only one face. The rest is as much a mystery, as if the whole orb were one of the most distant in the starry firmament, respecting the various movements that may be constantly taking place there.

Why is this? I ask, once for all. Will it be said it results from the demonstrated law, and therefore could not be otherwise? I have shown it to result from the law; but I have shown that the moon might, like the earth, have been made to rotate with a moving force sufficient to overcome that resulting from this law. The demonstration is of what *is*, not of what would be on another hypothesis. We find that the Author of nature and her laws has not given the moon this independent rotative velocity, but only that which results from the law; and we find this the case with other, perhaps all satellites. This certainly indicates the beauty of simplicity in the plan of the solar system. But does it indicate nothing more? What purpose of wisdom God may have subserved or be subserving by the present arrangement belongs not to scientific research, as being simply undiscoverable, and not revealed in Scripture. Natural Theology can go some way in pointing out the design and utilities that are patent in many works of nature. But here is a case in which nature draws the robe of mystery round her, and lays her interdict on rude philosophic gaze. Respecting this, then, we must wait for the light of the immortal state. To my mind there is nothing more mysterious in the whole walks of science, nothing my reason can less grapple with in the doctrines of theology, nor more inscrutable even in the things which "eye hath not seen nor ear heard." Is the moon, as one writer has speculated, the world of retribution? This I cannot base on even probable evidence; and it would be hard to conceive a world of woe shedding on us the mild benignity of moonlight. Or, more pleasing

thought, has the Redeemer fixed his throne of glory there? And will he thence descend to conduct the great assize? This we cannot solve, and scarce conjecture. The tranquillity already referred to may lead to speculation on the moon as a refuge from some world of agitation; but in this, imagination is equally lost.

Nor need we be surprized at the scanty success of astronomers respecting the moon's further hemisphere;—for what have they achieved on the nearer, which is full in view? They have told us of mountain ridges, vales, and plains; and something of “shining rays,” suggesting ideas of luminosity and fire. And recently some have thought they detected a diffused greenness, suggesting the idea of something like forest vegetation. On grounds more intangible than these, many conclusions are confidently drawn respecting the antiquities of this world. And the idle question is put: Why are beings not seen? The reply has been given in the fact of their minuteness in respect to the power of telescopes. But it is more plausibly asked: Why might not public works be seen? If we knew that the wants of lunarians require these, we might put the question; and it may be conjectured that some great erection, as a city or fortress, should be seen. But how? The walls to be seen must be not only of sufficient length, but sufficient breadth; and their height is probably insufficient to make any visible distinction between them and the plain. The mountains and deep cavities are discovered only by their shadows. Light, shade, and diffused colours may be seen, but the shadow of a fortress or a tower, unless it be out of all proportion to the works of men, must be quite too minute to be visible.

On what analogy is the moon supposed to be a desert? Why, the earth has been assumed by some to have been in a chaotic state before the six days. This is denied by geologists generally; and it is at best only a conjecture as to the meaning of the 1st verse of Genesis. Some geologists have also supposed various cataclysms to have occurred at distant intervals; but the universality of any of these is not admitted. But if the earth were mayhap a desert in the formation of granite (though facts do not prove that to have been a work of time—a day), still must I ask: Has the earth ever been a desert since the formation of its mountain ridges, its coal, trap, and alluvium. This cannot be alleged. Why then do we not equally reason from the igneous mountains and alluvial plains of the moon? To dispeople the moon is, so far as grounds of evidence can go, to dispeople the solar system, and the whole stellar heavens; for, as the moon is more minutely scanned than any other orb can be, the earth excepted, and more minutely than some tracts of the

earth, as those around the south pole, so indications of life cannot be more marked on any planet than on the lunar surface. We may see clouds indicative of trade-winds on Jupiter; but how know we that its atmosphere is such as any creature on earth could weather? We may see probable indications of snow on Mars. This may show the presence of vapour and alternations of heat and cold; but of an atmosphere *like ours*, astronomy can say nothing. If we are to believe that the solar system is peopled at all; if we are to admit any rational or animate beings besides ourselves, we cannot cramp our thoughts to the vertebral developments which we see, nor the chemical components of our atmosphere, nor a susceptibility of heat and cold just equal to our own, nor to many other conditions of actual life on our planet. If analogy is of any value in the matter, the analogies of hill and dale, and level alluvial land, of alternate light and darkness; of revolution with us round the sun, with approaches to and recessions from him; of earth-light analogous to our moonlight, and various others, surely go further than the mere apocryphal analogy of a geologic age. "Great and manifold are God's works; in wisdom has He made them all!" But how, if the moon was formed only, at least and during the whole period from the beginning of man's history to its close, to be our lamp? In that case, why was she not made twice as bright? And why was not another ordained to run opposite rounds so as to be at the full when the present one is invisible?

Among other lessons, we may learn this from our nearest neighbour. If she presents an enigma which baffles all science, simply by keeping her remoter hemisphere averted, what wonders and what secrets lie concealed in the remoter regions of the solar system. And what a universe of truth remains yet to be seen and known. Doubtless to enjoy the light of Messiah's glory will be Heaven; but to know more of God's works and of his creatures is a high and beautiful object of hope, collateral with, subservient to, and entering into the hope of glory.

ART. IX.—*Description of the Fort of Galna, in Khandeish.* By
A. RICHARDSON, Esq., C.S. [*With three Slabs of Stone,
bearing Inscriptions in Persian and Devanagri.*]

Presented 11th December 1856.

THE Fort of Galna, distant about 22 miles S.W. of Dhoolia, and somewhat less from Malligaum, is situated on a hill which the Aneroid Barometer showed to be 1145 feet above Dhoolia, or about 2082 feet above the sea.

Accessible from the country about it by one way only, viz. a broad flight of steps cut into the northern face of the hill, the approach in the days of bow and arrow warfare must have rendered it totally impregnable. These steps traverse the hill-side from east to west, and then, reversing the line, ascend again to the eastward, passing under five gateways, all but the lowest in good preservation; and that, being in the middle of the straggling and depopulated village of Galna, appears to have served as a kind of quarry to the modern inhabitants who have been in want of fine slabs of grey limestone.

The third and fourth gateways, about two-thirds of the ascent from the town, are approached by covered-ways, and are still furnished with strong iron-cased doors, and surmounted by walls nearly 20 feet thick, where the gateways are situated. These walls are continued along the face of the hill westward and eastward, till they unite into the highest battlements on the west and on the east ends of the hill, while a single wall encircles the plateau on the east, south, and west sides.

The upper walls are perfect, and contain magazines of various sizes in each of the bastions, which are semi-circles and must have commanded the approach in every direction on the S. and W., while the face of the hill, being almost perpendicular for nearly one thousand feet below the wall, the lines are as straight as the outlines of the rock allow, and have been defended by large wall-pieces, which were moved on iron pivots, many of which are still seen on the round bastions at every 80 or 100 yards, on the W. and N. faces.

The south side of the hill is a bare scarp, for so many feet from the wall, that it appears to have been considered unnecessary to erect any works for offensive warfare here; while at about two-thirds of the length from the east, there is a bastion in which are arches of Saracenic form,

between the central two of which was the slab containing the Persian inscription which is dated H. 977, A.D. 1561. The second slab was taken from a niche between the battlements fronting the north, and surmounting a row of cellars, which, as they are furnished with moderate sized windows, must have been intended for residences, since we found in those cells which had no windows heaps of small stone, cannon balls of various sizes, and a considerable quantity of damaged gunpowder. This slab contained an inscription in the Davanagri character, dated Saka 14 —, and below it were four lines in Persian, to the effect that, that particular bastion had been built by one Mahomed Ali Khan, and completed on the first of Rubi-ul-Akhir H., or, from the employment of the Arabic numerals, it may be Soorsun 985, which will make the date 14 years later.

This tower and bastion is close to the N.W. corner of the fort, a part where the whole of the wall shows appearances of comparatively recent repairs, with the *débris* of the original structure in the valley below. It is the weakest portion of the whole work, and the place where a breach would be made practicable. However, I am inclined to think that, from the height of the hill above the plains, the absence of any hills within some miles of the Fort in any direction but the east, (where a round-headed hill of nearly the same altitude as that on which the Fort is built, lies within a mile and a half of the fort walls), and from not being able to find any marks of cannon balls on any of the walls or buildings, no attack supported by artillery, was ever made on this Fort; and that the repairs were the consequence of some unusual fall of rain, or perhaps of an attempt to construct a reservoir of water on the plateau above. Walking from this tower on a narrow stone pavement which connects the whole circle of the battlements by flights of steps, as the ground rises or falls, and proceeding eastward towards the entrance gateways, we came upon a tower so constructed as to command the entire route of ascent, and immediately facing, of course, at different elevations, the third and fourth gateways.

From this tower the side of the hill, sloping so as to render the plateau on the top more conical towards the E. than it is towards the W., admitted of two walls, furnished with batteries for swivel-guns and pierced with loop-holes at every elevation, so that from this point to the eastern extremity, every stone of the ascent, from the village to the mosque might have been enfiladed from numerous positions.

There we found the third tablet, dated H. 993, A.D. 1577, the latest inscription on the Fort, but which ascribes its foundation to Mahomed Ali.

Underneath this tower are many cells still filled with bad powder and small limestone or trapstone balls, of so curious a nature that one would imagine they could reach the plain only in the shape of dust.

The hill above this spot approaches within 30 yards of the wall, and from this tower to the mosque there are a series of caves under the hill, which have been cut out of the rock, but are now filled with water, and inhabited by tortoises and bats. Some of these, from the remains of walls in them, must have been used for stores or for prisoners; while beyond is the mosque, which is in perfect preservation and very handsome. It is open to the east, and upon a stone terrace from which a few steps lead down to a small square tank of masonry, beyond which again the descent to the plain is commenced. The mosque consists of one room about 48 feet long from N. to S., by perhaps 25 broad, and has one very handsome, carved, stone window in it opening on a balcony which is surmounted by an elegant cupola from whence there is a magnificent prospect.

Below lies the deserted village still called the "town" of Galna. As we rode through the long rows of vacant sites, certainly not twenty grown-up men, perhaps a dozen children, and less than that number of women, were counted; but three distinct lines of walls, evidently the designs of different ages, and suited for defence against various styles of attack, can be easily traced.

On the south, ranges of low hills, a most difficult country either to cross or to travel, fall behind each other to the bank of the Panjar, some fifteen to eighteen miles distant, and the green masses of trees, the white houses, and the long walls of the jail at Dhoolia are distinctly visible as the sun declines; while the distant, northern horizon is bordered by the dim but picturesque outlines of the Satpoorah Hills, beyond the Taptee. To the east, the wide valley of the Taptee, intersected by the rapid but scanty streams which water Khandeish and all run into it, forms a plain, which, but for the abrupt peak of Lulling Fort and the rough forms of the hills near it, continues unbroken, till it vanishes in the mists, which hang over the cotton fields of Berar; and on the west, is an impenetrable mass of mountains of every variety of shape and hue, which extends from the Taptee to the peaks of the Syhadree Range round Supta Shring and Dhorubghur, (4112 and 4760 feet respectively above the sea,) from which the chain is continued on, in bleak outline of cone and table-land, until far in the S.E. the dim figures of the Shyadree Range sink into the plains beyond Adjunta.

ART. X.—*Old Tombs in the Cemeteries of Surat.*
By A. F. BELLASIS, Esq., C.S.

Presented 10th October 1861.

THE town of Surat was one of the first places in India at which the English established a factory, and carried on a lucrative trade. The Portuguese had made several Settlements along the western coast at a much earlier period, and we read that they pillaged the city of Surat even in A.D. 1512. But the Dutch, English, French, and for a short time, the Swedes, all established factories for trade at Surat in the beginning of the seventeenth century. The first English ship is stated to have reached Surat in 1608. The Dutch established themselves in 1617, and the French a few years later.

The English and Dutch factories were the most successful ; and after various vicissitudes of fortune, both these nations obtained favourable terms from the Emperors of Delhi and the Nawabs of Surat, and carried on a most thriving and prosperous trade. The French, on the contrary, obtained an unenviable character as pirates and plunderers, and did little in the way of commerce. The agents of these several nations vied with each other to live in the greatest splendour. In 1662 Sir George Oxenden, and after him Gerald Aungier in 1669, were the English Presidents of Surat. These Presidents are described to have lived in a handsome house, with upper and lower galleries, richly ornamented with carvings. Besides the public apartments where business was transacted, there were suits of private rooms with "a neat oratory," and a common dining hall, at which all the factors and writers, twenty-eight in number, usually dined. The vessels and dishes were all of massive silver ; each course was ushered in by a flourish of trumpets, and a band of music played during dinner. The President, when he went out, was preceded by a standard-bearer, a body-guard, a host of attendants with led horses, an umbrella of State, and other insignia of pomp and rank. The Dutch Presidents paid still more attention to these matters, with a view to impress their power and consequence on the minds of the natives.

Men who lived in such grandeur may naturally be supposed to have

emulated each other in erecting ostentatious tombs to commemorate their dead ; and thus we find the sepulchral ruins in the cemeteries of Surat, even at the present day, bearing witness to the large sums that must have been expended for these purposes. Among the most pompous mausoleums in the English cemetery is that erected over those " most brotherly of brothers," Christopher and Sir George Oxenden. The structure is in fact made up of two tombs, of which one is interior to the other. Christopher died in A.D. 1659 ; and the first building, a domed structure, with four pinnacles at the corners, was erected over his grave, and an epitaph, written by his brother, was placed within it on a small marble slab. It is written in the old English character, and is a model epitaph for an exact merchant. It is as follows :—

" Hic situs est Christopherus Oxinden, probitatis
Exemplum vitæ, sed vitæ morte caducæ,
Intrat et exiit, hic incepta animamque finivit.
Ille dies tantum numerare Logista valebat,
Non annos, nam raptim exegit mors rationem.
Quæritis, O Domini, quid damni vel quid habetis
Lueri ? vos servum, socium nos, perdidit ille
Vitam, sed per contra scribat mors mihi lucrum.
Exijt a vitâ Apr. 18. 1659.

This may be freely translated :—

" Here lies buried Christopher Oxinden, by his life an example of probity ; by his death, one of the perishable nature of life.

" He makes his entrance and his exit. Here he brought to a termination his undertakings and his life.

" He was able to enter in his accounts only days not years, for Death suddenly called him to a reckoning.

" Do you ask, O my masters, what profit you have gained, or what loss you have suffered ?

" You have lost a servant, we a companion, he his life ; but on the other side of the page he may write ' death to me is gain.' "

Sir George Oxenden died in A.D. 1669, and Christopher's tomb was then inclosed in another, similar in style, but two stories in height, and remarkable for the peculiarity of its dome, which represents an open cross. In the upper compartment of this building is inserted a large marble slab bearing an inscription to the memory of Sir George, in which he is magnificently described as " Anglorum in Indiâ, Persiâ, Arabiâ, Præses." Both inscriptions are well preserved. The mausoleum of the Oxendens is thus described by Anderson :—

" The height of this monument is forty feet. The diameter twenty-

five ; massive pillars support two cupolas rising one above the other ; and round their interiors are galleries reached by a flight of many steps."

The inscription is as follows :—

Interrogas ? Amice Lector !
 Quid sibi vult grandior hæc structura ! Responsum habe,
 In hoc gloriatur satis quod alteram illam grandem continet,
 Superbit insuper quod una cum illâ tegit generosos duos fratres
 Fraterrimos,
 Qui et in vivis fuerunt et etiam in mortuis sunt quam conjunctissimi.
 Alterum velis intelligas ? lege alibi.
 Intelligas velis alterum ? lege hic.
 Dominus Georgius Oxinden Cantianus
 Filius natus tertius D. Jacobi Oxinden Equitis.
 Ipse equestri dignitate ornatus
 Anglorum in Indiâ, Persiâ, Arabiâ, Præses,
 Insulæ Bombayensis Gubernator
 Ab Illustri Societate pro qua presidebat et gubernabat
 Ob maxima sua et repetita in eam merita
 Singulari favoris et gratitudinis specimine honestatus.
 Vir
 Sanguinis splendore, rerum usu,
 Fortitudine, prudentiâ, probitate,
 Pereminentissimus
 Cum plurimorum luctu, obiit Julij 14^o
 Cum plurimorum frequentia sepultus est Julij 15^o
 Anno Domini 1660
 Anno Ætatis 50.
 HÆUS LECTOR,
 Ex magno hoc viro, vel mortuo aliquid proficias.

In the immediate neighbourhood of the Oxenden mausoleum is a tomb of considerable pretension, supposed to be that of Gerald Aungier, but it has no inscription : near to these again, are tombs which bear the names of Bernard Wyche, chief of Surat 1736, and of Annesley, displaying the armorial bearings of these families. The devices of western heraldry quaintly contrast with the semi-saracenic architecture of the tombs, and with the luxuriant tropical foliage in which they are embosomed. We have also three more with Latin inscriptions, viz. that of Francis Breton, President 1649, Henricus Gary 1658, and Bartholomew Harris, President 1686.

The Annesley inscription runs as follows :—

Hic jacet Samuel Evance Annesley Honorabilis Viri Samuelis Annesley,
 Angli—Et Susannæ Uxoris ejus filius ; Natus Mart. 18. A.D. 1697-8.
 Variolis correptus eodem die An: 1702, Mortuus die 21.

Hic etiam jacet Frater ejus Cæsar Annesley Natus 8vo Maij 1700, e
 morbo spasmi 30 Julij sequentis Mortuus cum duobus abortivis.

Among other Presidents and people of importance of Surat whose tombs now exist are :—

Stephen Colt Latt, President of Surat. *Æt* 45. 1708.

James Hope, Chief for the affairs of the British Nation at Surat. *Æt.* 47. 1747.

Mary wife of Brabazon Ellis, Chief of the English Factory at Surat. *Æt.* 36. 1756.

William Andrew Price, Chief for the affairs of the British Nation, and Governor of the Mogul Castle and Fleet of Surat, 1774.

The tomb of Baron Van Reede, in the adjacent Dutch cemetery, is described to have exceeded all the rest in magnificence ; and it was built with the intention of eclipsing that of Sir George Oxenden. It consists of a double cupola of great dimensions, with a gallery above and below, supported on handsome columns. It was formerly adorned with frescoes, escutcheons, and passages from Scripture, and the windows were filled with much beautiful wood carving. Some idea may be formed of the original cost of this tomb, by the fact of a bill being extant, charging Rupees 6,000 to the Dutch Company for mere repairs : while time and the elements have left most of the others without name or date, it still retains three inscriptions. The one to Baron Van Reede is inscribed in a compartment on the wall itself, opposite the door as you enter, and on either side are hung two large black wooden tablets, with the following Dutch inscriptions cut therein, in white letters and in a running hand.

The inscription which records the Baron's titles and the date of his death is as follows :—

Hier Rust
Het Lichaam van
Zyn Hoog Edelheyt
D. H. r. — Hendrik Adriaan
Baron Van Reede
Tot Drakensteijn Heere van
Meydiegt
Onder de ordre van de Ridder
Schap en ugt de selve ordre
Gecommitteerd in de Ordinaris
Gedeputeerde van D'Edle Mogend
Heeren Staaten S Lands van
Utrecht
Commissaris van de Generale
Nederlandse Gecontroyeerde
Oost Indische Compagnie over
India
Reprenterende in dier qualite
De Vergaderinge der Edle Heeren

XVII^{en}Overleden den 15^{en} DecemberA^o 1691

Op't Schip Dregerlant Zylande

Van COCHIM naar SOURATTA

Op de Hoogte van de Engelse

Sterkte bombai ;

Oud Ongevaer

56 Jaaren.

This may be translated :—

“ Here rests the corpse of his high nobility the Lord Henry Adrian, Baron of Reede of Drakenstein, Lord of Meydiegt—graced with the Order of Knighthood and usually delegated by the same Order as Deputy of the noble and mighty Lords, the States of the Province of Utrecht ; Commissary of the United Netherlands, licensed East India Company for India, representing in that quality the assemblies of the noble Lords the Seventeen. Departed the 15th December, Anno 1691. On board of the Ship Dregerlant sailing from Cochim to Souratta abreast of the English Fort bombai,* aged about 56 years.”

Here is another Dutch inscription, of Paulus de Roo, 1695 :—

Dit aauchourende, Leser, gedeunt dat hier mede ter saligen opstandinge rust het lichaam van Wijlen Den Edelen Agtbaren Heer Paulus de Roo van ——. In syn Edele leven Commissaris van Wegens de belangen der verenigde Nederlandse geectroyeerde Oost Indische Compagnie in Souratta, en langs de Custe Mallabaar, mitsgaders Geligeert Gouverneur van net weyduijt gestrekte Eyland Ceylon. Overleden den 9 augustus Anno 1695. In den ouderdom van — Jaaren — Maanden, en — Dagen.

Trans.—On contemplating this, Oh Reader ! Remember that here within, till the blissful Resurrection, rests the corpse of the umquhile noble, worshipful Lord, Paulus de Roo, of — In his noble lifetime Commissary with regard to the affairs of the United Netherlands' licensed East India Company in Souratta and along the Mallabar Coast, as also Emerited Governor of the extensive island of Ceylon. Departed the 9th August Anno 1695 at the age of — years — months and — days.

And the following of Magdalena Haijers 1642 ; and Bastina Theodora Le Boucq, of 1743.

Hier leyt Begraven De Eerbaere Deugtrij e juffrouw Magdalena Haijers.
In Haer Leven Huis vrouwe van D. E. Hr. Directr. Paulus Croocq,
overleden Adi : 29 November A^o 1642 Syn : oudt 27 Jaeren.

* The names of Cochin and Surat are in capital letters, contrasting with that of Bombay in small letters, shows the then relative importance of these places.

Trans.—Here lies buried the honorable, chaste Lady, Magdalena Haijers, when alive Housewife of the Honorable Director Paulus Croocq.

Hier onder Rust mede ter saligen opstandinge het lichaam van wijlen vrouwe Bastina Theodora D. Le Boucq Gemalinne van den E. E. Agtt. Heer Jan Schreuder Directeur en oppergebieder van wegens den staat der Verenigde Nederlandse g'octroyeerde Oost Indische Compagnie in de Ryken van Goa, Souratta en Hindoostan, met den aankleve van dien. Geboren aan Capo de goede Hoop den 15th Majj Aq 1708 en alhier overleden ; den 7th Majj Aq 1743. Oud Synde ; 34 jaaren, 11 Maanden en 22 Dagen.

Trans.—Here below rests till a blissful resurrection the corpse of the umquihle Lady Bastina Theodora D. LeBoucq, Consort of the noble, honorable, worshipful Lord John Schreuder Director and Superintendent on account of the state of the United Netherlands' licensed East India Company in the Kingdoms of Goa, Souratta, and Hindostan, together with their dependencies—Born at the Cape of Good Hope the 15th May Aq 1708, and departed here the 7th May Aq 1743, being 34 years, 11 months and 22 days of age.

Also others in Dutch, viz. :—Carolus Pelgrom 1655. Jacob, the little son of Heer Jan Schreuder, Æt. 5m. and 15d. 1741. Joseph Buffins 1774. Christiana Hendrietta and Gertrude Cornelia, daughters of Abraham Leopoldus Bratiaare, (child and infant), who died respectively, 1787 and 1789. Mattys Monte, of Dortrecht, Gent. Æt. 66, 1797. Egidius Myer, Gent. (a Swede), Æt. 67, 1800. Henricus Sissingh, of Gertrudenberg, Gent. Head-Surgeon of the Netherlands E. I. Comp. Æt. 58, 1808, &c.

It would be tedious to describe the many other mausoleums, which crowd the English and Dutch cemeteries of Surat. They are mostly of one type, taken from Mahomedan models, of which they are bad imitations ; many have fallen into decay and crumbled away, and many of the marble tablets have been stolen, and used by the natives to grind curry powder for their daily repast ; while another half century probably will lay the proudest level with the dust. The inscriptions upon the oldest and most noteworthy of these tombs have therefore been copied and published as above.

Two of the earliest English travellers, who visited Surat and wrote an account of their travels in the East, were Ovington and Fryer ; and as their works are scarce, extracts, giving their description of the Surat cemeteries, may be interesting.

The Reverend J. Ovington, a Chaplain in H. Majesty's Service, who published his voyage to Surat in A.D. 1689, writes :—

“ The English and all the Europeans are privileged with convenient repositories for their dead, within half * a mile of the city. There they endeavour to outvie each other in magnificent structures and stately monuments, whose large extent and beautiful architecture, and aspiring heads, make them visible at a remote distance, lovely objects of the sight, and give them the title of the principal ornaments and magnificencies of the city.

“ The two most celebrated fabrics among the English, set off with stately towers and minarets, are that which was erected for Sir George Oxinden, and the other for the renowned and honorable President Aungers. The two most noted among the Dutch are, one a noble pile raised over the body of the Dutch Commissary, who died about three years ago, and another, less stately but more famed, built by order of a jovial Dutch commander, with three large punch-bowls on the top of it, for the entertainment and mirth of his surviving comrades, who remember him there sometimes so much that they quite forget themselves.”

Fryer, who published in 1698 an account of nine years' travels, from 1672 to 1681, describes the Surat cemeteries thus :—

“ From thence, [the Broach Gate,] we passed over to the Dutch tombs, many and handsome, most of them pargetted, adjoining to which the Armenians have a garden, where on a terrace (40 yards in length and 5 in breadth) are reared several monuments, coffin-fashion, with a place to burn incense at the head, like the Moors, only over it a cross : one of more eminency had an arch over it at the upper end.

“ Thence we took a round, though the inclosures are contiguous to the English tombs, short of which the Portuguese have a burial place.

“ The ground the English dead are inhumed in is stocked not with so many tombs as the Dutch, though in one of Sir George Oxenden it excels the proudest.

“ The French have a separate place to deposit their dead, over against the English, with only one single tomb, and that a small one.”

Another burial ground for Europeans was at Swall̃, the sea-port of Surat, a village about twelve miles west of the city, in the Oolpar district, outside the mouth of the Taptee, where there was a good roadstead for anchorage, and deep water for ships. The fleets usually arrived from Europe between September and March, when Fryer tells

* Showing that the outer wall of the city was not then built.

us that the merchants and bunnians of Surat crowded to Swally, and there pitched their tents and booths or built huts, so that it resembled a country fair in England. On these occasions, some of the principal factors and, at times, the Presidents of Surat resided at Swally, where the houses of the English, Dutch, and French were distinguishable by their national flags. There was a good landing place, and on the sea-side was the European burial ground. Here it was, according to Terry, that Tom Coryat, known as the "English Faqir," died and was buried. Coryat, who had devoted his life to travelling in foreign countries, on his return to England from a tour through Europe, published a laughable account of his travels, styled "Coryat's Crudities." On returning from one of his travels, he is said to have hung up in his native village church, at Odcombe in Somersetshire, as a donarium, a pair of shoes in which he had walked 1975 miles. In 1612 he again started from London, limiting his expenses to twopence a day, which he procured by begging. He first went to Constantinople, thence to Alexandria, visiting Cairo and the Pyramids: he next explored all the venerated places in the Holy Land; and passing with a caravan from Aleppo to the sites of ancient Nineveh and Babylon, he proceeded through Persia, Candahar, and Lahore to Agra, where he appeared before the Great Moghul, Jehangeer, and pronounced an oration in florid Persian, and so delighted His Imperial Highness that he obtained Rupees 100 as a reward. From the court of the Emperor of Delhi, Coryat journeyed to Surat, and shortly after terminated his pilgrimage in December 1617, by drinking too freely of "sack." As Fryer states,— "he was killed with kindness by the English merchants, who laid his rambling brains at rest."

The exact site of Coryat's grave is involved in considerable doubt: this is the more singular, as Coryat had a great fear that he should die in the jungles and that future ages should not know where he was interred; which, in a manner, has come to pass.

Of the authorities quoted below,* Coryat's tomb is mentioned in three only—Terry, Herbert and Fryer. Fryer was at Surat in 1674, or 58 years after Coryat's death, and did not write his book till 24 years later. Fryer tells us he was acquainted with Herbert's book; and it is likely enough that he repeated what Herbert had said before him, regarding the location of Coryat's burial place, though, by his going into details, he speaks as an eye-witness of what he believed to be the

* Terry, Herbert, Vietro della Vallo, Thevenot, Philip Baldrens, Careri, Ovington, Bernier, Tavernier, Fryer, Mandelslo, Niebuhr, Stavorinus.

tomb in question. The place pointed out by him is not near the existing Veriow Gate, but outside the Broach Gate, near the minaret. Thevenot, who was at Surat a few years earlier, (A.D. 1666) calls the gate by the same name, "la porte Baroche," and says that the tombs, Dutch and English, were 300 or 400 paces beyond it.

The present gates are quite modern; even the interior line of wall, including "la porte Baroche," was not built until after Sivajee had sacked the town. When Coryat died in 1617, there was nothing but a mud wall round the town, situated probably between the two existing lines of circumvallation. Hence it is a mistake to look for his tomb outside the present Veriow Gate.

Herbert landed at Swally on the 1st December 1626, nine years after Coryat's death: he says—"The same day we came to anchor in Swally Roads, the Persian Ambassador died, poisoned with opium. His son conveyed him to Surat (10 miles hence), where they entombed him not a stone's cast from Tom Coryat's grave, known but by two poor stones that speak his name, there resting till the resurrection."

This would appear decisive; but Terry, who arrived at Surat a few months after Coryat died, and who lived at the Factory for two years after, says equally decidedly—"At the East Indian shore at Swally, on the banks thereof, amongst many more English that lie there interred, is laid up the body of Mr. Thomas Coryat," and then goes on to say—"He (Coryat) overtook death in December 1617, and was buried (as aforesaid) under a little monument, like one of those that are usually made in our churchyards."

Between these two conflicting evidences (for Fryer merely repeated what Herbert had written) it is impossible to decide positively. But the preponderance of evidence is more in favour of Terry than of Herbert. Terry was a personal friend of Coryat; they lived in the same house and tent, when about the Moghul's Court at Agra and elsewhere, and, as is evident by his book, he took great interest in all Coryat's doings: Nothing is more likely, therefore, than that, when the Embassy returned to Surat in 1618, Terry should have gone to see his old friend's grave; the more especially as he wrote an epitaph for the same.* Besides, Terry was a clergyman, and consequently, likely to know all about the burial places of the congregation. So much for Coryat.

Not far from Swally is another tomb which seems to me deserving of brief notice. It has withstood the decay of time, and is still now well known as Vaux's Tomb. Vaux was a protégé of Sir John Child, who, during his Governorship at Bombay, made him a factor, and in time

* A poetical effusion that was never engraved on stone.

promoted him to be Deputy Governor. In 1697, while Vaux and his wife were enjoying a sail on the Taptee, the boat upset, and both were drowned. Their tomb, with a high dome built in the Mahomedan style, is situated at the mouth of the Taptee River, and is still a landmark for vessels as they cross the bar, in sailing up the Taptee to Surat. It contains no inscription of any kind, and is now used as a residence for some men who are stationed there in charge of the light at the mouth of the Taptee river.

Tombs of the Bohras.

The only other tombs in Surat which seem to merit notice, are those which enclose the remains of the Mullahs or high priests of the Dáwudí Bohras.

The word 'Bohra' is most probably derived from the Sanscrit व्यावहृत् (*vyavahár*), which in Urdú is *byohar*—trade, business, traffic. From this comes Byohará, trader. Some, however, derive this name from that of a town in Arabia in which the Indian apostle of the sect was born.

Dáwudí Bohras are an offshoot from the great Shia sect of Mahomedans. Their Mullahs trace the succession of their order up to Mahomed-bin-Abdulla, who was the founder of a new variety of Shias in Arabia, about A.H. 296, and who claimed lineal descent from Mahomed-bin-Ismael, one of the immediate successors of the (so-called) prophet. The followers of Abdulla separated in process of time into two parties, under two leaders, each of whom claimed to be the true high-priest; and Dáwudí Bohraism originated in a sub-division of one of these great parties, some acknowledging Abdulla as their pontiff, while others adhered to his son-in-law, Suliman.

The adherents of the sect in Western India are, no doubt, for the most part, converts from Hinduism. The missionary, by whom the first converts are said to have been made, rejoiced in the same name as his great predecessor, Abdulla, above referred to. It seems he came from Yemen, in Arabia, to Cambay in the year of the Híjira 460. Among his first converts was a Hindu Rajah, named Sídra Jey Sing, through whose influence the tenets of the new faith were propagated among his subjects. At the present day the Dáwudí Bohras are to be found in considerable numbers in all the principal towns of Goozerat and Rajputana, and in Bombay, Poona, and Hydrabad. Surat is the Pontifical Seat, and contains, among its various inhabitants, about 6,000 persons belonging to this tribe.

Like all Shias, they exalt Ali to a rank second only to that of his illustrious father-in-law. They received the Koran as a divine revelation;

but at the same time held certain esoteric doctrines, which it is very difficult for the uninitiated to ascertain. Secrecy as to these is considered one of the prime virtues among the initiated.

A certain proportion of the income of every Bohra is given to their Mulla, whom they venerate and obey as the earthly representative of God himself. He, in return, grants on behalf of each one of them at death, a certificate which is buried with the body, and is supposed to secure the entrance of the departed into Paradise.

The residence of the Mulla and his numerous relations is in a part of the city called the *Jampa*; there also, is his *Madrasa* or college, and the Musjid in which he worships; and there also are the famous "Mullas' tombs," which form one of the few sights of Surat worth the trouble of a visit.

The mausolea, two in number, are situated in front of the great Musjid, in a large quadrangular enclosure, in which are also a cistern constantly full of water, and numerous sarcophagi covering the remains of the less distinguished relations and dependants of the Mullas. The more worthy, including several of their preceptors, are permitted to rest within the mausolea. These are large, domed edifices, with gilded spires, rising to a height of more than thirty feet. The larger and newer of the two, covers a more extensive area than is occupied by the famous Oxenden mausoleum in the English burial ground. The other is considerably smaller, but encloses a greater number of the illustrious dead; the number of sarcophagi in it being 24, and in the larger only 14. Those of the Mullas and their preceptors are of marble, the others of *chunam*. They are of the usual Mahomedan form. All have rich silk coverings thrown over them; those of the Mullas being distinguished by an additional covering of white muslin. From the centre of the dome of each mausoleum is suspended a magnificent chandelier, which is lighted up on the anniversary of each Mulla's death.

The remains of five Mullas rest within these splendid edifices. Their names and date of death respectively are as follows :—

Múllá Nazm-u-din,	died	A.H. 1213,	A.D. 1798.
„ Saif-u-din	„	1232,	„ 1816.
„ Ezziy-u-din.....	„	1236,	„ 1820.
„ Zein-u-din	„	1252,	„ 1836.
„ Bhadru-din.....	„	1256,	„ 1840.

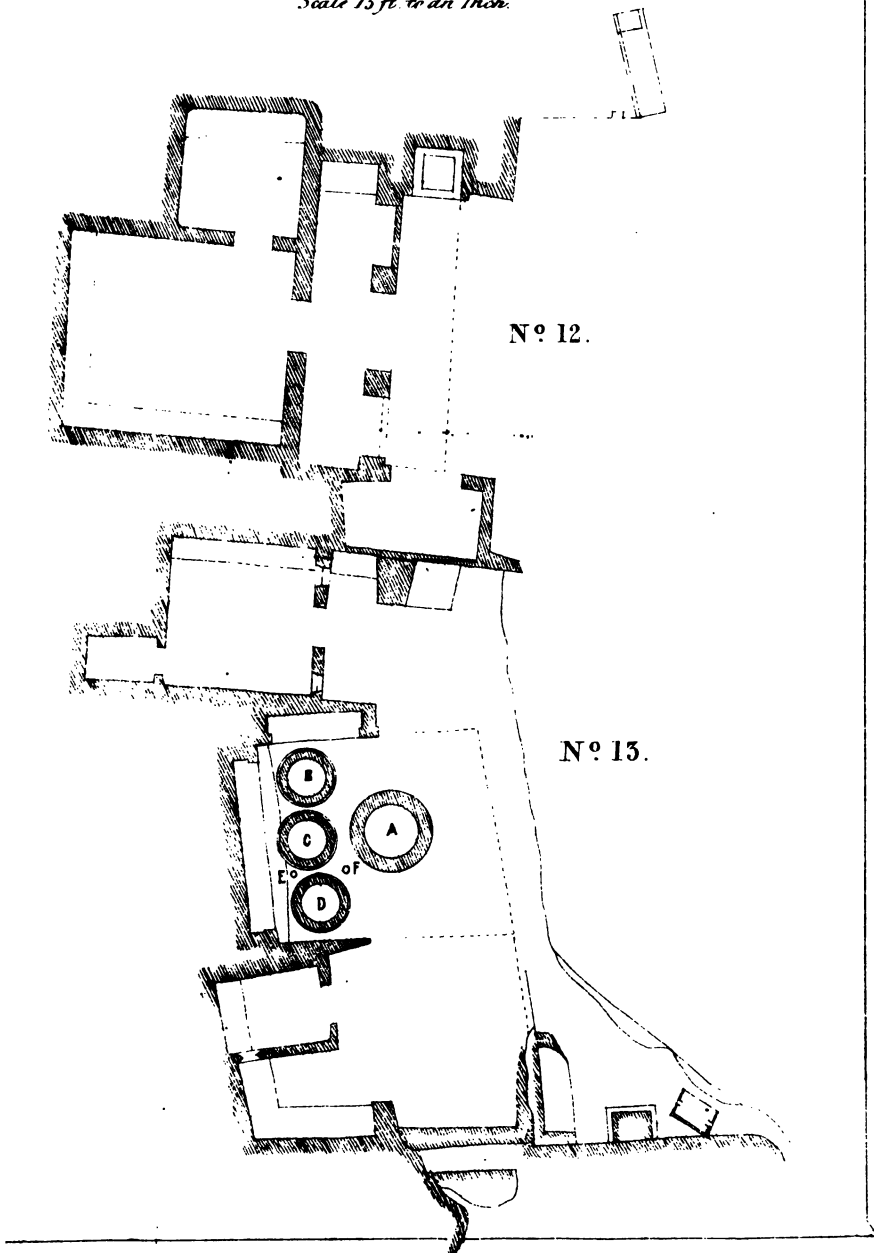
KANHERI.

Plan of Caves, Nos. 12. and 13.

by

E. W. WEST, ESQ.,

Scale 15 ft. to an Inch.



GEOLOGICAL SOCIETY
OF LONDON
PETERSEY HOUSE

KANHERI

Seal-impression in dried clay.

natural size.

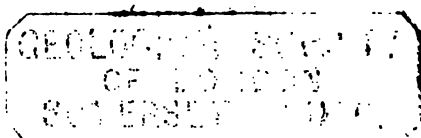
Front View.



Vertical Section.



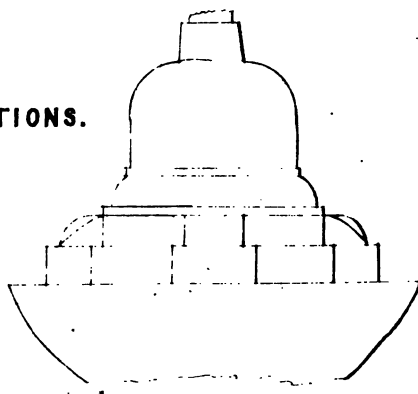
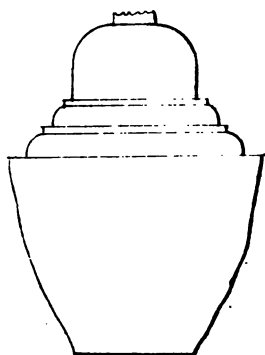
Horizontal Section.



SEAL RECEPTACLES OF DRIED CLAY FOUND AT KANHERI.

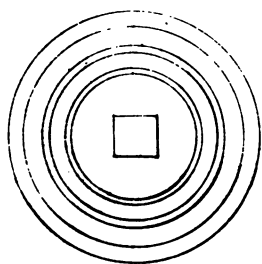
Half their real dimensions.

ELEVATIONS.

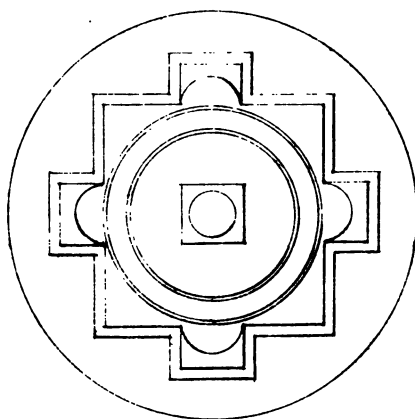


PLANS.

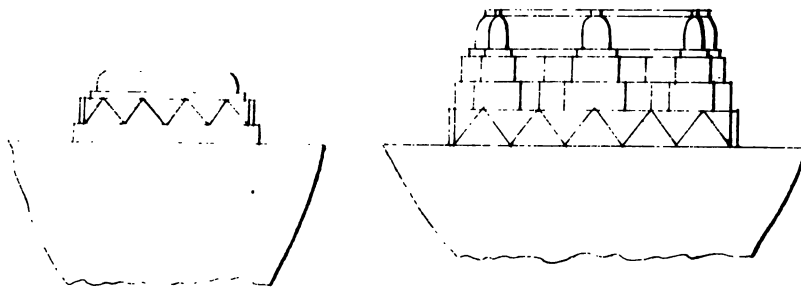
1.



2.

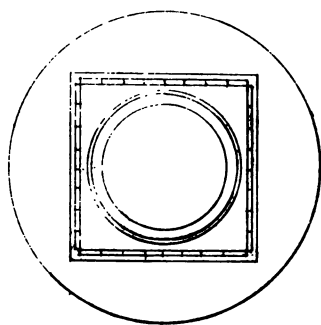


ELEVATIONS.

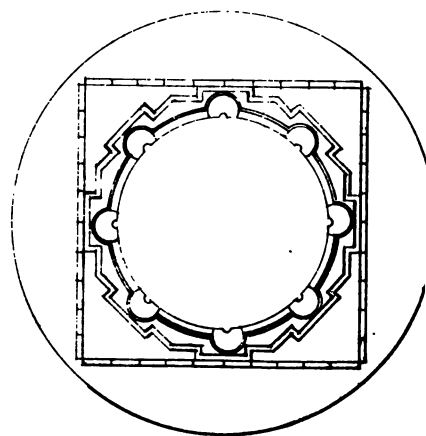


PLANS.

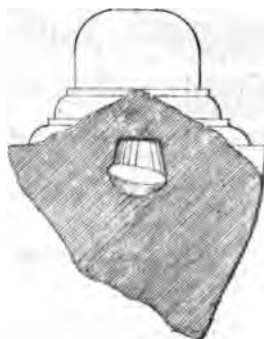
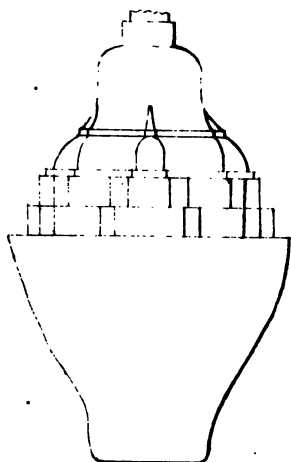
3.



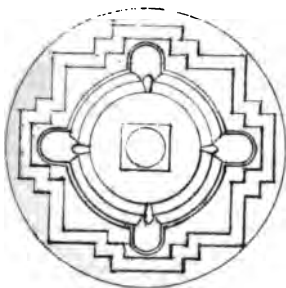
1.



ELEVATIONS.



5.

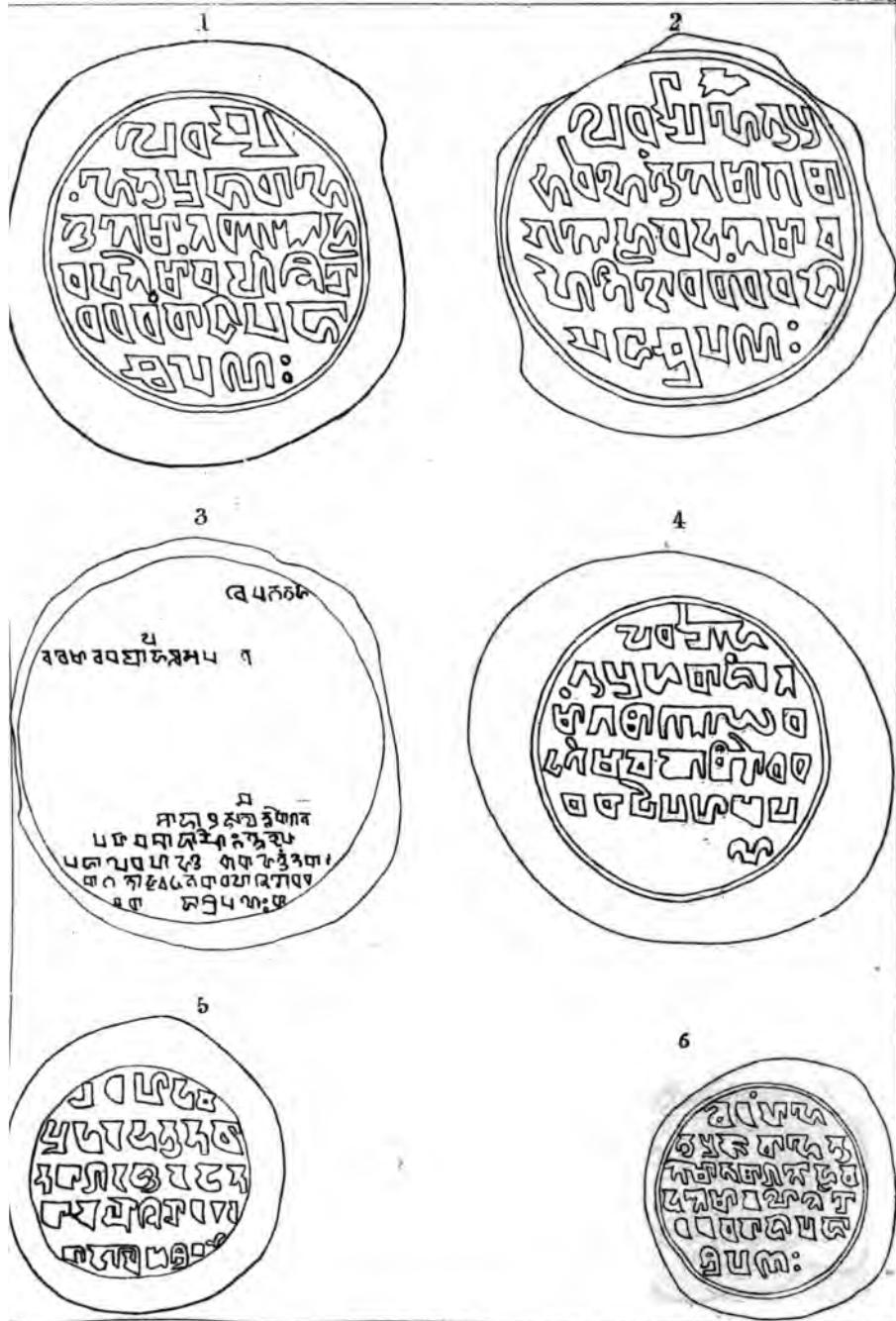


PLAN.

SEAL IMPRESSIONS IN DRIED CLAY FOUND AT KANHERI.

Twice their real dimensions.

PL. VIIa



7



8



9



10



11



12



13



14



15



16



17



18



19



20



21



KANHERI.

Fragments of moulded clay found with the seal-impressions.
natural size

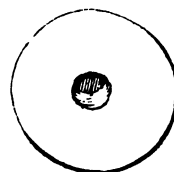
1



2



3



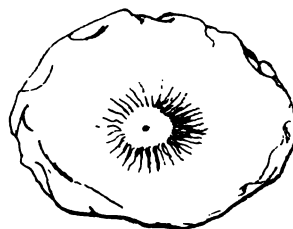
4



5



6



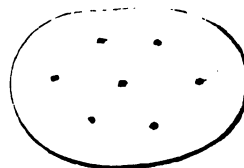
7

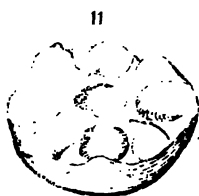
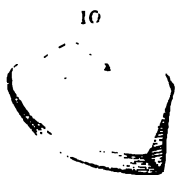


8

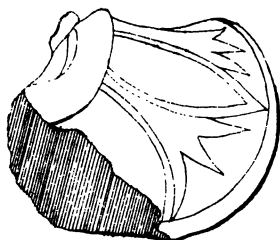


9

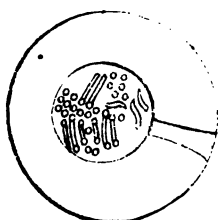




17



18



Plan.

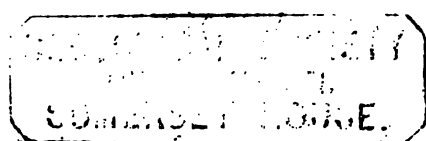


Section.

19

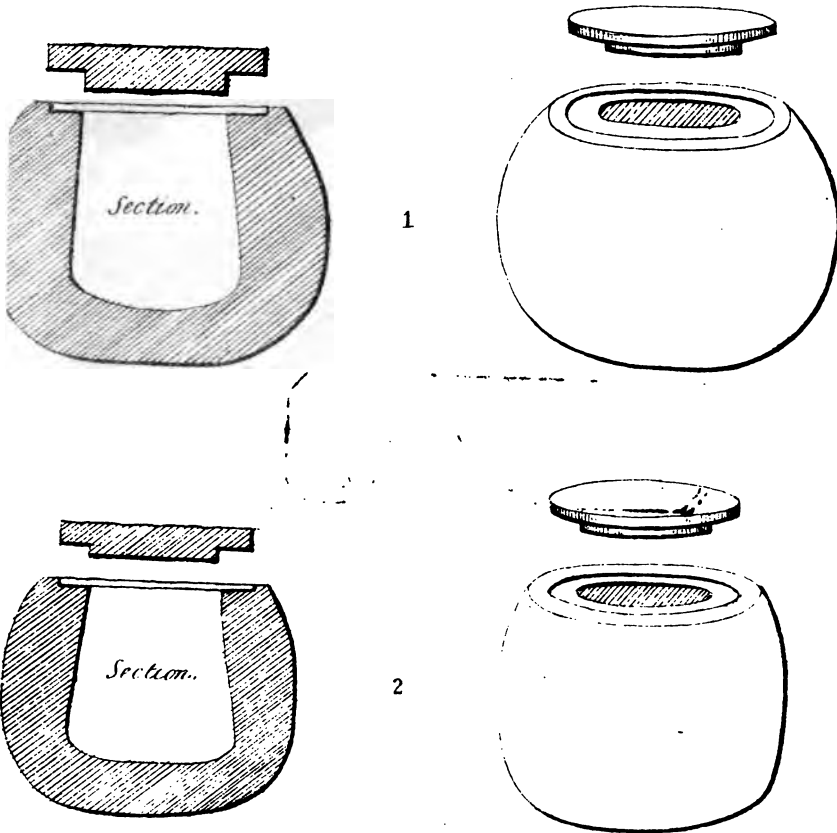
*Brass or copper ear-ring
natural size.*



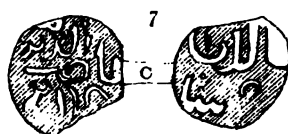
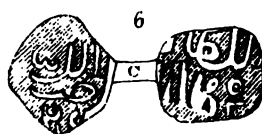
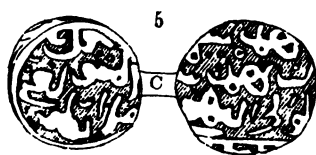
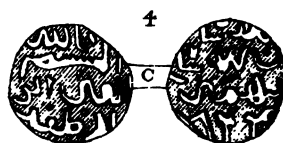
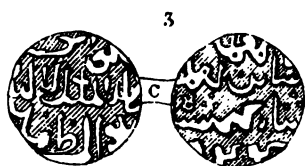


STONE-POTS FOUND AT KANHERI.

One-fourth their real dimensions.



Copper Coins found in the stone pots



ART. XI.—*Result of Excavations in Cave No. 13 at Kanheri.**
By E. W. WEST, Esq. [*With a Plan and five Plates.*]

Presented 10th October 1861.

SOME interesting discoveries were made in 1853, by digging in Cave No. 13 at Kanheri. This Cave and No. 12 form the group of excavations shown in the accompanying detailed plan (Plan III.), raised a few feet above the bed of the nulla at Kanheri, on its southern side, and near the middle of its length, where its width is increased by its junction with a small branch nulla, as may be seen in the general plan of the caves †. No. 13 originally consisted of three caves, but the walls indicated by dotted lines have been destroyed, merely leaving traces of their existence upon the ceiling. The two side caves contained inner chambers, provided with the usual benches; while the centre cave was a single chamber with two benches in recesses, at the back and right-hand side; but, owing to the destruction of the walls, this chamber is thrown open to the others and to the outer air. The floor of this central cave was covered with earth, from which protruded the foundation of the circular erection c, which appears to have been a small tope, or dagob, built of unburnt bricks. This tope was found to be empty, but excavations were made in the earth around early in October 1853, which resulted in the discovery of the three other circular foundations A, B, and D.

The circle A, appeared to have been undisturbed since the destruction of its super-structure, in whose ruins it was buried, and was nearly emptied without anything unusual being noticed, when some pieces of dried clay attracted attention among the dust thrown aside, and proved upon examination, to be fragments of impressions of a seal representing a sitting figure of Buddha surrounded by ornaments (Plate V.). Further search in the dust resulted in the discovery of many similar impressions in dried clay, also several impressions of circular seals of various sizes, bearing inscriptions. Some larger fragments of dried clay were also noticed, which had been moulded into peculiar forms, and were subsequently discovered to have been the receptacles in which the impressions of inscription-seals had been imbedded; these had been broken up by

* See page 5 *ante*.

† Plan I.

the diggers while clearing out the circular foundation; a few other fragments of moulded clay were also found.

The other circles B and D, were afterwards examined, but only a few more impressions of the sitting figure were found in them, as they had probably been opened before. Two circular stone-pots with covers were also found buried between the topes at E, and F.

The accompanying drawings represent the whole of these discoveries in detail.

The larger fragments of dried clay were found to be portions of six varieties of seal-receptacles, which have been figured in a restored form as far as possible, (Pl. VI. *a, b, c, d,*) but only one specimen of each of the forms Nos. 3, 4, and 6 having been found, those figures are less complete than the rest; fragments of four specimens of No. 1, three of No. 2, and sixteen of No. 5 were discovered. No. 7 shows the position occupied by the impressions of inscription-seals in the body of the receptacle, though sometimes imbedded in the cupola; they were laid face to face in pairs, and one pair imbedded in each receptacle.

The impressions of inscription-seals are small circular pieces of dried clay, with a flat face, bearing an inscription in relief, evidently the impression of a seal, and a rounded back, which bears the impression of the skin-markings of the palm of a human hand; showing that the clay was laid upon one hand, while the seal was impressed with the other. Of these seal-impressions 68 have been found, of various sizes; being the impressions of 22 different seals, of which 21 have been figured, (Pl. VII. *a, b, c, d,*). The number of impressions of each seal respectively, are as follows:—

No. 1 seal, 7 impressions.				No. 13 seal, 2 impressions.			
„	2	„	2	„	14	„	2
„	3	„	10	„	15	„	3
„	4	„	3	„	16	„	3
„	5	„	5	„	17	„	1
„	6	„	5	„	18	„	1
„	7	„	3	„	19	„	1
„	8	„	3	„	20	„	1
„	9	„	1	„	21	„	1
„	10	„	1	Not figured.... 1			
„	11	„	6	Illegible..... 2			
„	12	„	4				

Among the seal-impressions first found, No. 1 was the most distinct, and a very cursory examination of the letters detected some words of the Buddhist formula, and this led to the deciphering of the whole inscrip-

tion on this and other seal-impressions. Excepting Nos. 3, 9, 10, 15, and 17, the inscriptions are precisely alike (though differently divided into lines), and represent, in letters of about the tenth century, the following well-known words, "ye dharmá hetu prabhava hetun teshán Tathágato hyavadat-teshán cha yo nirodha evamvádí Mahá Shramana." In addition to these words, No. 9 has $1\frac{1}{2}$ line more of illegible letters, with an ornament at the bottom; No. 10 has an ornament below; No. 15 has the syllable "há," or "hí," with an ornament; and No. 17 has a large central ornament. The inscription on No. 3 seal, in 16 lines, was long considered illegible, the letters being exceedingly small; but the accidental discovery that the last letters were "Shramana," led to the deciphering of the last three lines, forming the same inscription as on the other seals. This inscription, however, accounts for only 35 letters out of about 270; and though some attempts have been made to decipher the preceding part of the inscription, by a comparison of specimens, still the result is very doubtful without some clue to the words, or a thorough knowledge of the language. The seal which is not figured bears probably the same inscriptions as No. 3, the number of lines being apparently the same, and the letters are larger, but less distinct.

All the impressions representing the sitting figure of Buddha, (Pl. V.) have been made with the same seal, as the same defects occur in all; they do not appear to have been imbedded in receptacles. The figure is represented seated cross-legged under a canopy, surrounded by ornaments, and with three lines of inscription beneath it. Some letters in this inscription are imperfect, and difficult to decipher as all the impressions are equally defective; but it is very nearly the same as on the inscription-seals, with some variation after the word "Tathágato." Portions of 70 distinct impressions of this seal were found in Cave No. 13, of which 2 were unbroken, 55 were pieces containing the whole sitting figure, and the remainder were in smaller fragments. The flat faces of these impressions have been painted red, while the rounded backs bear distinct impressions of the skin-markings of a human hand, showing that the seal was impressed in the same manner as the inscription-seals. Similar impressions in dried clay exist in a museum in Edinburgh, where they are labelled as coming from Ceylon; and similar impressions in lac are figured in Moor's *Hindu Pantheon*, and stated to exist in the Museum of the East India Company.*

* The Honorable the *President* (W. E. Frere, Esq.) exhibited some which he had obtained at Ceylon, and stated that they were not uncommon there; also that they were found attached to, and under little cupolas, which thus formed their bases respectively.—*Ed.*

Could this practice have been continued down from the Assyrians whose period

A variety of Fragments of moulded clay, found with the seal-impressions, have been figured in different positions (Pl. VIII. *a*, *b*, *c*). It is doubtful what they represent; but it may be observed that, if any of Nos. 1 to 11 be placed upon any of Nos. 12 to 16, they will form mushroom-shaped ornaments, which will fit on to the broken tops of the seal-receptacles.

No. 17 may be a fragment of a larger umbrella-shaped canopy. No. 18 appears to be one-half of a mould for casting coins, and bears the impression of a coin, which may possibly be a very rude representation of a man on horse-back.

The brass or copper earring, No. 19, is one of a pair, found imbedded in a small ball of ashes.

The Stone-pots here figured (Pl. IX. *a*) are now in the Museum of the Bombay Branch of the Royal Asiatic Society. They were found buried in the earth between the topes, No. 1 at *E* and No. 2 at *F*. (Plan III.) They are cut out of laterite, or some similar stone, and have covers fitting down upon a sunken ledge on the top of the pots. In each of these pots, about a table-spoonful of ashes was found, also the three copper coins, Nos. 3, 4, and 5 in one pot, and two other copper coins, Nos. 6 and 7, in the other pot (Pl. IX. *b*). The coins Nos. 3, 4, and 5 appear to have been little worn, and are covered on both sides with well-defined Arabic inscriptions, which differ in each coin, though all three bear the date 844, which probably coincides with A.D. 1440-41. The coins Nos. 6 and 7 are much worn, and the inscriptions are difficult to read and contain no date.

In Cave No. 23 (Plan I.) there are traces of a somewhat similar group of small topes, which has been only partially examined. Seven broken impressions of the seal with the sitting figure were found; also two or three thin earthen cooking-pots buried in ashes and dust, and full of earth; and it seemed probable that the tope had been opened and the seals-scattered about, before the earthen pots had been buried.

extended to the capture of Nineveh, about 625 B. C. and therefore to about the beginning of the Buddhist era? Sir H. Rawlinson exhibited before the Society in July 1855, some cylinders and little pillow-shaped masses of baked clay similarly impressed to those of Kanheri and Ceylon, but with cuneiform inscriptions, and stated that, "the number of these tablets already exhumed [from the ruins of Nineveh] could not be less than 10,000, and they appeared to embrace every branch of science known to the Assyrians; (this Journ. Vol. V. p. 483.) The two sculptured lions at Elephanta taken from the escutcheon of Budh, and constantly introduced into the religious ornaments of the Sivites, are, with the exception of being in a sitting, instead of a standing position, nearly *fac-similes* of the Assyrian Lion figured in Layard's 'Monuments of Nineveh' (Pl. II.), and not like the existing lion."—*Ed.*

ART. XII.—*On Contributions to the Geology of Western India, including Sind and Beloochistan.* By H. J. CARTER, Esq., F.R.S.

Presented 14th November 1860.

IN the last number of the Journal I contributed all the unpublished facts that had come within my knowledge up to that time of the Geology of Western India, &c., and in the present number I propose to record all that have occurred since. They are as follows :—

Discovery of Ammonitiferous Limestone near Jeyselmeer in the Great Desert, &c. By Dr. IMPEY.

The following observations are recorded upon information received from Dr. Impey, both orally and by note, respecting certain geological specimens which he collected and forwarded to the Society in 1858, when travelling from Roree on the Indus to Jeyselmeer, in the "Great Desert," and from thence to Jodpoor in Rajpootana.

Dr. Impey states in his note that, the course lay over loose sand all the way from Roree until arriving within 40 miles of Jeyselmeer, where he met with a "kind of conglomerate apparently of the same sand hardened."

About 20 miles westward of Jeyselmeer there are some wells at a place called Koochee, and from the sides of these he knocked off some pieces of rock which (describing from the specimens sent to the Society, and which are deposited in the Museum) consists of deep, ochre-yellow-coloured, compact limestone, charged with ammonites of a deep ferruginous claret colour. These fossils are all small, but numerous, and on making a vertical section and careful sketch of one of them, I find that it closely approaches *A. opis*. Sow. (Grant's Geology, Cutch). The yellow limestone is evidently the same as that stated to be brought to Balmeer for tomb-stones (see Dr. Forbes' geological specimens from Balmeer in the museum of the Society); and also that forming part of the ruins of the famous city of Mandoo, in the Vindyah Range towards the lower part of the Nurbudda (see Lieutenant Blake's specimens from Mandoo in the Museum). From the latter and other circumstances, I conjecture that,

the same formation may be found somewhere about the lower part of the Nurbudda.

The specimens of ammonitiferous limestone from the northern border of the "Runn" of Cutch in the Museum, also agree, in their *two* colours respectively, with the specimens from Jeyselmeer, but there are belemnites also present with the ammonites, and the limestone is more or less arenaceous, indicating a proximity to sandstone strata in the same series. *A. opis* also comes from the northern border of the Runn.

On his way from Koochee to Jeyselmeer, Dr. Impey found all the strata to be composed of micaceous sandstone, which the specimens show to be compact but not crystalline. He did not see any limestone at Jeyselmeer; from Koochee to Jeyselmeer there is a slight ascent all the way; but on leaving Jeyselmeer and going eastward toward Pokurn there is a descent to a place called Lathee, which is the lowest point between Jeyselmeer and Pokurn. Here he found apparently (from the specimens) the same kind of micaceous sandstone, but white or slightly yellowish, and containing silicified fossil-wood, stems of plants, &c. of a brown colour. I cannot make out more of these remains, although they are large and numerous; the wood appears to be dicotyledonous, but is too opaque for microscopical examination.

This sandstone continues all the way to Pokurn, but here becomes red again. The white variety is very like in appearance and consistence to some which Mr. Blackwell (late Mineral Examiner to the Government) brought from the caves of Bagh, on the Nurbudda.

Sandstone would seem to continue on to Jodpoor, for from this locality also Dr. Impey sent specimens of the red kind, one of which is so micaceous that it contains much more mica than sand, the two ingredients being more or less separate and interlaminated with each other. He also sent specimens of clay-strata, brick-coloured and green, which had evidently been baked by heat.

In an article in the *Standard* newspaper (April 1858), written by an "Eye-witness," it is stated that, about 40 miles N.W. of Jodpoor are white-marble quarries. The character of the country here is wavy, in mounds, no hills or rocks, and from the mounds, by a kind of "burrowing" process, the author states that blocks of the marble are obtained. Fine specimens of "flexible sandstone," I also learn from a friend, are to be obtained from Jodpoor and its neighbourhood.

Are these sandstones and limestones continuations eastward of the members of the Jurassic Formation in Cutch? The ammonites of Koochee look very much like those said to characterize this series.

Geology of the North Bank of the Nurbudda from Baroda eastward.
By the late Major FULLJAMES.

In "No. XXIII." of the printed "Selections from the Records of Government of Bombay," page 100, we learn from a geological communication by the late Major Fulljames, that the first rock which makes its appearance above the alluvial soil after leaving Baroda and travelling eastwards is reddish syenite and granite. He then meets with "mica-schiste" from Jumbogaum to Jumboghora.

Visits the village of Chalwar and the Sooneekee Doonghur or "Hill of Gold," which consists of mica-schiste. Many rocks of different kinds are to be seen here. Blue slate, &c.

From Jumbogaum goes to Teyghur and Jaitpoor, where he sees granite and mica-schiste.

From Teyghur to Chota Odeypoor,—granite, felspar-rocks and serpentine. Some good specimens of grey-marble were brought from Dewchuttee, which is $7\frac{1}{2}$ miles N.E. of Chota Odeypoor. From Chota Odeypoor to Kuralee, and on to Wasna,—mica-schiste.

Wasna to Aggur.—About a mile from the former place the ground begins to rise a little, and a few limestone rocks make their appearance, which look like "greyish marble." This ridge continues all the way, on the right side, to the village of Chametra (6 miles). About a mile, after the limestone has made its appearance, a close-grained, whitish sandstone crops out in large tabular masses, and then red sandstone in fine slabs.

The "Wasna" here situated, cannot be the one alluded to by Major Fulljames at page 299 of the same "Selections," from whence he obtained his specimens of nummulitic limestone; but knowing of no other "Wasna" at the time, I assumed it to be this (see the last No. of the Journal, page 624). It will be rather a little village by this name on the south side of the Nurbudda, among the Rajpipla Hills, about 10 miles south of Ruttunpoor, where the "Cornelian Mines" are situated. There is also a "Wasna Nana" near Vaneitha, a little further north than Ruttunpoor; thus the name appears to be common in this neighbourhood.

In the "Government Selections" (No. XXIII., Part I., page 3, "Guzerat,") Major Fulljames also states respecting nummulitic limestone:—

"The other branch (of the Rajpipla Hills) turns southerly, and follows the course of the Taptee River along its northern bank and extends as far as Turkeysur Pergunna, from whence I have seen specimens of rock composed of fossil shells of the nummulitic limestone formation, particularly specimens of *Nummularia acuta*, *N. Obtusa*, and *Lycophris*

dispensus, which are abundant in Cutch in such a formation. This rock is, I am informed, used for building purposes, and also affords an excellent lime."

The report from which this is extracted was submitted to Government on the 10th August 1852. The town of Turkeysur is only 10 miles N.E. of Surat.

Discovery of Nummulitic Limestone in situ at Turkeysur. By A. ROGERS, Esq., C.S., Collector of Surat.

In a "note" made by Sir Bartle Frere on that part of my "Summary of the Geology of India" relating to the extension of the nummulitic formation southwards, and communicated to me 20th September 1854, Sir Bartle Frere states as follows :—

"The late Dr. Malcolmson (of Messrs. Forbes' House) informed me that, he had ascertained the existence of at least one nummulitic bed, crossing the Valley of the Nurbudda in the Rajpipla Hills. He first detected the nummulites in a pebble which he found in the bed of the river, and after having carefully examined the beds of the neighbouring affluents above this, was at last rewarded by finding a stratum of limestone about six inches thick filled with nummulites and cropping out of the bottom of a ravine which branched off from the Nurbudda.

"Expecting that his observations would be published, I regret that I did not ascertain the exact spot, but my impression is that it was not very far up the river."

The late Dr. Malcolmson, who was Secretary of the Society, died at Dhoolia in February 1844, whither he had gone, partly in pursuit of his favourite science, viz. Geology, and had travelled up the valley of the Taptee to confirm some previous observations, probably among which was the discovery of the Nummulitic Formation, to which Sir Bartle Frere has alluded.* The next mention of this fact was noticed in Major Fulljames' Report to Government, dated August 1852, as above stated, when he also sent the specimens of Nummulitic Limestone on to the Society, which were brought to him from Wasna. After this, I got no more intelligence of the Nummulitic Formation here, until Captain Chambers, of the Madras Engineers, about nine months since (November 1860), brought me a small specimen of a yellow rock charged with

* See a short account of the life of this excellent man, too soon removed from the sphere of his exertions, for the interests of science and the Bombay Asiatic Society! "*Bombay Times*," 30th April 1844. I am informed that he left his "Notes" with the friend in whose house he died, and that they were afterwards forwarded on to Messrs. Forbes and Co. What has become of them?—*Ed.*

Orbitoides dispansa, and a small striated nummulite, which he had knocked off a block of stone forming part of the walls in the castle at Surat. In this I immediately concluded that I had a portion of the same formation as that sent by Major Fulljames from Wasna; and, putting the foregoing facts together, we inferred that the stone of which this castle is built was probably obtained from the nummulitic rocks of the Rajpipla Hills, and therefore that this formation would by-and-by be found not far off from Surat.

Finally, this was confirmed by Mr. Alexander Rogers, of the Bombay Civil Service, now Collector of Surat, who, forwarding large portions of a yellow limestone rock densely charged with large specimens of *Orbitoides dispansa*, and a small nummulite belonging to the *Striata* (probably the species which is found at Wasna, and which to me appears identical with *N. Ramondi* as before stated), accompanied them by the following information, which is extracted from his letter to me, dated 31st August 1861:—

“I send you, for your inspection and for presentation to the Bombay Branch of the Royal Asiatic Society, some specimens of nummulitic limestone, which appears to correspond with that of the Rajpipla Hills and the Cutch formation described by Colonel Grant. I found it at Turkeysur, about ten or twelve miles to the eastward of the railway station, which is at the Keem river, between Surat and Broach, where the country first begins to be undulating and intersected by ravines, as it approaches the hilly districts of Mandwee. I had not time to ascertain the extent of the formation, but found it cropping out from the surface for above a mile from where it lies upon it. The whole appeared to be equally abundant in fossils; in fact, I suppose the whole rock is little more than one mass of them. Those imbedded in the surface are, as you will see, for the most part peculiarly perfect. There is no mistaking *Operculina*, *Nummularia* and *Orbitoides*. The latter, of every size, can be observed, and in every possible variety of section.”

In another part of his letter, Mr. Rogers identifies the orbitoides with *O. dispansa* and the ephippial variety mentioned in Colonel Grant's Geology of Cutch. The largest specimen sent to the Society, which is in the rock, is two and half inches in diameter, so that *Orbitoides dispansa* and *Orbitolites Mantelli* (as will be seen hereafter) reached the size of the largest *Nummulites*.

Since the above was written, Mr. Rogers has sent to the Society some more specimens of the same kind of Nummulitic Limestone from a place called Bhadee, about 35 miles S.W. of Ruttunpoor, in the Un-

clesur Pergunna, which place must be near the village of Wasna, from which it was originally obtained through Major Fulljames.

Thus the existence of the Nummulitic Formation in considerable force, is established in the Rajpipla Hills, which form the westernmost termination of the Satpoora Range, and which range again, a little further in, is composed of Trap.

Now the interesting questions will be, to determine how the Nummulitic Formation here lies with relation to the trap of this range. Whether there have not been effusions and eruptions of trappean or volcanic rocks since it was deposited. What relation the bed of agate-conglomerate, in which the so-called Cornelian Mines exist, bears to the Nummulitic Formation. Where the latter meets and overlies the deposits of cretaceous age, which were discovered by Major Keatinge higher up the Nurbudda river, on the north side, near Bagh,—the site of a set of famous Buddhist Cave-temples.

From the red colour given to the yellow ochraceous cornelian conglomerate by "baking," corresponding with that which it possesses naturally, in some parts, and the like with the nummulitic limestone, from the Rajpipla Hills, I conjectured that this had been occasioned by the effusion of volcanic rocks through some parts of it, and this was confirmed by information communicated to me by Mr. Blackwell, who visited the cornelian pits close to Ruttunpoor on his way up the Nurbudda in 1857, and on his return showed me a point on the map, about 6 to 8 miles east of Ruttunpoor, where, he stated, there was a "hill of the conglomerate capped by trap."

Then, as regards the relation of this conglomerate to the Nummulitic Formation, I have assumed that, it is the basal part of this series:—*1st*, because it is chiefly composed of agates rounded by attrition, which for the most part came from decomposition of the older trappean rocks in which they were imbedded (*e. g.* there is an agatiferous trap of this kind in Bombay, crossed over by the road leading from the Horticultural Gardens to Parell Tank on the crest of the hill, from which the agates, small and great, are falling out daily, and lying about in the form of rounded pebbles, which, when broken, are hollow or solid, as the case may be); *2nd*, on account of one of the same kind of agates being in a portion of the nummulitic limestone from the adjacent village of Wasna which were sent to the Society by Major Fulljames; and *3rd*, from the nummulitic series on the opposite coast of Arabia, in the island of Masira, which is similarly circumstanced with respect to trappean rocks, being based on a more or less agatoid conglomerate. However, as all this is but conjecture, and the Rajpipla Hills are now, by the railroad,

easy of access, and hold out a sure return to the geologist who will take the trouble to examine them, it is to be hoped that they will not remain long unexplored.

Notes on the Geology of the Islands around Bombay. By H. J. CARTER, Esq., F.R.S.

Having lately had an opportunity of visiting all the islands situated in the estuary surrounding Bombay during the past year, I will state briefly what a cursory geological examination of them has afforded me.

They consist, beginning with the southernmost and going northwards, of Carinja, Pandia, Shiwa, and Hog-Island, west of which lies Elephanta and Butcher's Island, and then, north of this, Green-Island and Trombay, which is the southwesternmost part of the island of Salsette,—Salsette itself, which is much the largest of all, and the island of Bassein north of Salsette.

Carinja.—This island is composed of trap, being a portion of the great beds of Western India enfiladed by dykes of black-basalt, and thrown up into two small mountains, called respectively "Great" and "Little" Carinja. The southernmost or Great Carinja consists of a large portion of the trappean beds, about 1,000 feet (?) high, of an oblong form, with its longest diameter N. by W. and S. by E. raised up bodily, but wedge-shaped, viz. with its scarp toward the east and slope towards the sea or west; while the northern mountain, or Little Carinja, which is but a little lower in its highest part than its companion, consists of a trifid basaltic dyke, which, starting from the summit or Great Trigonometrical Survey Station, which is marked by a little white tomb, extends N. by W. and S. by E. in one direction, and about S.W. from the summit in the other. On the shoulders of these lines rests more or less of the old trappean beds, which, from previous disturbance, have been washed away by denudation, but the great scarp of the whole being towards the east, as in the other mountain, shows that the elevating force must have been subsequent to the intrusion of the dykes.

The beds of trap, of which the mountains are composed, vary in structure and density. They are all more or less greenish or bluish when un Decomposed, and more or less amygdaloidal; but there is one in particular that varies in thickness under fifty (?) feet, which is more solid than the rest, and may be seen projecting out from the scarped side of the mountains about a-third way up from the base of Great Carinja, but, of course, varying in position with the elevation of the beds among which it lies. It is from this bed that building-stone must be expected, and near the northern end of the island there are two insignificant Cave-

Temples in it ; while it has been resorted to largely in the island of Elephanta for this purpose, as the celebrated Sivite Cave-Temples in it here testify. All the other beds are more or less decomposed to the extent of many feet below the surface, and therefore the basaltic dykes, from the hardness and durability of their material, frequently stand out boldly from them like walls or the remains of Cyclopæan Architecture, as on the southern end of the smaller mountain called " Little Carinja."

The dykes again, mostly run N. by W. and S. by E., and are chiefly visible at the northern and southern extremities of the island when the tide is out, though they are prominent enough also in the middle, where they make their appearance in the ends of the two mountains respectively, towards the precipitous side.

One description will suffice not only for the basalt of which these dykes are composed, but for that composing all in the neighbourhood of Bombay, viz. it consists of a dark, black, hornblendic rock, the edges of which show by transmitted light, under a magnifying glass, a brownish colour through the hornblende, and a greenish one through the felspar ; fine, granular, crystalline in structure, sparkling when fresh ; tough or brittle, breaking with a rough fracture or splintering, under the hammer ; sometimes amygdaloidal ; decomposing in spheroids, exfoliating, and at last passing into a brown or red earth. The cleavage of all these dykes will be observed to be across them, hence they are frequently, where exposed, very much divided up into fragments, whose lines of separation are also chiefly in this direction.

I have stated that all the dykes are composed of the same kind of material, but I should have added " when pure," for in one, which runs through the northern corner of Great Carinja, I found a large mass of pink-and-white Pegmatite. This is a significant fact as regards the origin of the mountains of volcanic breccia or conglomerate, which exist in and around the island of Bombay, and therefore of such importance in a geological point of view, that I shall reserve it for separate description, making merely this passing notice of it here, as it so far forms a part of the geological description of the island now under consideration.

Lastly, on the outer or western side of the island of Carinja, may be observed the Shell-concrete (common to the western coast of India hereabouts), imbedding more or less of the hardened rolled fragments of the trap on which it is deposited : and though only a few feet thick, indicating, from higher level towards its inland border, an elevation since it was deposited like that of the same formation seen on the outer coast of Bombay and the island of Salsette.

Pandia, Shiwa, and Hog-Island.—None of these appear to be more than 50 (?) feet high, and all follow each other northwards from Carinja, where they represent the border of the mainland almost, for they are barely separated from it, except at high-water. In a geological point of view, however, they are interesting, because they are chiefly made up of the black-basalt of the dykes, which is not only observed here and there in veins and straight path-ways, as it were, passing through the old amygdaloid trap, but forming the highest masses of these islands and presenting little headlands towards the harbour. This basalt closely corresponds to that forming the outer ridge of the island of Bombay, differing only from it in appearing to be a little browner on the edges by transmitted light, rather than greenish, which that of Malabar Hill is. But we have only to compare the latter with the bluish-green trap of the inner ridges of the island of Bombay, and we shall find that the whole are only varieties of the same hornblendic (? augitic) trap-rock. Thus the blackness, and preponderating quantity of this basalt on the islands under consideration, so far, corresponds, on this inner or mainland side of the harbour, with the same kind of rock which forms the outermost or seaward ridge of the island of Bombay.

Elephanta.—Two masses of amygdaloid trap, divided by a deep ravine running through the island, N. by E. and S. by W.; bedded like that of Carinja, and presenting the "solid stratum" about half way up to their summits, in which the Sivite Caves are excavated,—form this island. No doubt basaltic dykes present themselves about the base at low-water, but I have not been there at this time, since I commenced to examine these islands geologically. Highest points 500 to 600 (?) feet.

Butcher's Island.—This little island, which lies to the westward of Elephanta, and therefore more in the middle of the harbour, is composed of bluish green amygdaloid trap (of the "old beds," ?) hardened apparently by the proximity of basaltic dykes, as that of Carinja, &c., one of which may be seen in its eastern extremity, running in a nearly north and south direction. Highest point about 40 (?) feet.

Trombay.—This, which is the third largest island of the group next to Salsette and Bombay, consists, like Carinja, of a mass of the old trappean beds of the mainland thrown up into a great ridge, running nearly north and south, and a smaller one or spur, at right angles to it, extending inland or eastwards to the village of Trombay. The main ridge is nearly two miles long, and rises gradually from its southern to its northern extremity, where it attains the height of 1,000 feet. At this point is a circle of stones, marking a station of the Trigonometrical Survey. It is precipitately scarped towards the east, and slopes towards

the west, presenting in its scarped surface a thick, solid bed, like that mentioned in the islands of Elephanta and Carinja.

Basaltic dykes run out about S. by W. from its southern point; but a little further northwards, towards the village of Trombay, they may be seen to run E.S.E. and W.N.W., showing plainly that all the dykes in this locality do not run in the general direction, viz. a point or two on each side of north and south. Following that part of the shore of Trombay which leads round the opposite side, viz. towards Bombay, we at first find it much enfiladed by a group of basaltic dykes which, at low-water, are seen to lie parallelly to each other, and extend a considerable way out in the direction last-mentioned, after which the shore for the most part becomes composed of mingled basalt with the old trappean beds, which thus presents a tough, rugged, contorted breccia, till we arrive opposite Green-Island, where this ceases, and three or four straight dykes, again, running a little to the eastward of north and westward of the south, parallel with the long diameter of Bombay and its ridges, extend to Green-Island, and mark that corner of Trombay, which is its nearest part to Bombay.

Green-Island.—This is a little ridge running about N. and S., about ten feet high, and formed of a bed of solid bluish trap, which has been tilted up towards the east, where it presents a scarp; while it slopes under the mud and sea of the harbour towards the west, thus following in its inclination that of all the other ridges of the locality. Along its eastern side runs a basaltic dyke which connects it with the corner of Trombay just mentioned; and it should be remembered that in the midst of the basalt of this dyke many pieces of the older trap-rock are visible, which are in all degrees of transition from their natural colour and structure to that of the black-basalt of the dyke in which they are imbedded, showing that heat only was required to assimilate the whole undistinguishably, and therefore that a uniform appearance of the basalt is by no means proof that in its outflow to the surface it has not melted into its own mass many fragments of the rocks which it has torn off and enveloped on its way. I say that this should be remembered, because very soon we shall come to volcanic breccias of this kind, in which the matrix is no longer black, but still must be considered as the black-basalt altered, from causes which it is not our business here to discuss. Where it is black, however, and the foreign portions have been thoroughly mixed up in it, it probably forms a black jaspideous rock, like that of Antop Hill, Sewree Fort, and Cross-Island, on the western shore of Bombay, rather than the granular, crystalline basalt of the dykes and of the seaward ridge (Malabar Hill) on the outer part of this island.

Returning to Trombay, and pursuing the shore opposite to the island of Bombay northward, we find it to be composed of solid trap, apparently belonging to the older beds, but broken up into hard and tough boulders by the intruding basalt, until we come to the hill at the Chimboor Causeway, that joins Trombay to Salsette, which is composed again, of the black-basalt of Malabar Hill and the dykes, but here in considerable mass, and more or less in layers, more like that of Malabar Hill. This is the largest tract of this basalt next to Malabar Hill that I have met with out of Bombay.

The spur leading from the main ridge of Trombay eastwards, and which is divided from the latter by a deep ravine, is also composed of beds of amygdaloid trap, but further than this I have not had an opportunity of examining it. Probably at low-water many dykes would also be found round its borders.

Salsette.—While the islands of Carinja, Elephanta, and Trombay belong almost in totality to the great trappean beds of Western India, Salsette, so far as my investigation extends, only contains traces of them here and there, where they have become imbedded in the volcanic breccia which forms the great mountainous district of the island, culminating at one point to 1551 feet above the level of the sea. This great mass of detrital matter, descending gradually in mountainous masses from the point just mentioned (close to which are situated the famous Buddhist cave-temples of Kanheri) extends nearly all over the island, ending in huge spurs, which abut upon the channel that separates the island from the mainland on its northern side, and in low hills, which, with the intervention of the small channel between Salsette and Bombay, are continuous on the south with the volcanic breccia of the latter,—a distance of sixteen miles N. and S., which is about the length of Salsette in this direction. Whether the same kind of volcanic breccia is continued across the channel northwards, and to what extent, remains for future investigation to show. On the east, this mountainous district is marked by a more or less precipitous face, which runs north and south, followed by a few low hills at the base, which extend between it and the channel, separating the island from the mainland on this side; while on the west, it slopes gradually in spurs and isolated hills, almost to the level of the sea, where the volcanic breccia is terminated by a ridge of basalt, which is more or less continuous throughout the outer or seaward margin of the island. Salsette is about fourteen miles broad in its widest part.

We have to turn our attention then 1st, to the Volcanic Breccia; 2nd, to the Basaltic Ridge on the outer side of the island; and 3rd, to the remains of the New, as well as Old, Trappean Beds of the mainland.

Volcanic Breccia.—For a description of this formation I must refer the reader to my “Geology of the Island of Bombay,” as it is but a continuation of the same formation which composes the NE. end of this island. It contains small tracts of blue trap (new and old?) here and there, which is more or less hard, tough, and brown, indicating that it has been more or less exposed to heat; and at the northern part of the island, where it borders upon the channel, it contains large masses of sedimentary strata in a chertified state, like the fragments of the sub-trappean Freshwater Formation in Bombay, which have been similarly exposed to heat, and which they probably are, as this formation, by-and-by, will be seen to have extended to the northern part of this island. For the most part, this breccia presents a ferruginous red colour, but in some parts it is brown, yellow, grey, or blue. All the groups of cave-temples, both Buddhist and Sivite, that are scattered about the island, have been excavated in it, on account of the facility with which it yields to the chisel.

Basaltic Ridge.—Seeing that the geology of Salsette was so much like that of the island of Bombay, and observing that the sea-ward or western borders of both islands presented a ridge which was more or less continuous, and in a line, from north to south, it struck me that this ridge throughout would be lithologically the same. It will be remembered that the sea-ward ridge in the island of Bombay is composed of black-basalt; sparkling, fine, stratified, and cuboidal in the mass; sloping toward the west, till it thus disappears under the sea, and raised towards the east, where it presents a precipitous scarp, beneath which, from north to south, crops out the inter- or sub-trappean Lacustrine Formation of Bombay.

I will now relate what I saw of the “Ridge” of Salsette, beginning at its northernmost point and coming southward:—

With the exception of the little portion at the villages of Goraee and Koosa, I have explored the greater part of this ridge, and find that it is continuous in tract, from Dharavee Point to Tuljun, in a north and south direction; but at Woogtun, another ridge outside it commences, which borders on the sea, and runs on to Goraee, being separated from the ridge between Dharavee and Tuljun by a flat valley not unlike the “Flats” of Bombay, but more fertile. The hill of Tuljun I have not been on, nor on that of Mallowlee to the south of it; but on that of Daraylee to the south again, which is composed of the volcanic breccia, and the colour of the other two hills being the same, viz. red, and different from the colour of the basaltic ridge, I infer that, all three of these hills are composed of the volcanic breccia.

We must now follow the outermost ridge, which commences at Woogtun, and, ending before arriving at Gorae, appears here again in an isolated portion, again at Koosa, then at Malar, and lastly at Versova respectively, in isolated portions, but in direct line north and south of each other. A long strand now succeeds, and falling back a little to the eastward, we meet with the ridge again at Danda, whence it is continued on to Bandora Point, where it is opposite to and in a line with Warlee Point, which is the northernmost extremity of the outer ridge of Bombay. Throughout the whole of this basaltic tract, the ridges have an inclined surface towards the west which dips under the sea, and a precipitous one towards the east, following the rule of nearly every hill-elevation in the neighbourhood of Bombay. Let us now consider it lithologically.

Returning to Dharavee Point, which has been quarried on its eastern aspect, we observe in its precipitous face that, it is very regularly columnar, and that the columns are many feet in length, but the basalt of the ridge, not black, but greyish-white or brownish; almost like trachyte; here, then, is a strong contrast to the ridge in Bombay,—the latter being stratified, cuboidal, and black.

On examining the rock of Dharavee Point minutely, it at first looks like a fine granular sandstone, but this granulation appears to be merely that of the crystals of felspar and hornblende observed in the trappean rocks generally,—without their colour; with this, too, are a number of minute, dark specks, consisting, apparently, of iron-ore (specular?), and others, much larger and of rectangular form, scattered through the mass, which are also of the same composition, but pseudo-morphs of felspar, as we shall see when coming to another part of the ridge. There is also here and there, in little cavities, a bright sulphur-yellow, amorphous mineral, soft in consistence, which, under the blow-pipe, becomes brown, and is attracted by the magnet.

At Dharavee Point also, the ridge attains its highest elevation (200 feet?), and being scarped on its eastern aspect, there is some appearance, though confused, of a stratified formation at its base, probably the sub-trappean Freshwater Formation of Bombay, but I had neither time nor light to examine it. Throughout, the ridge presents a light-brown, yellow colour on the surface; here and there on the sea-ward side it appears in great spheroidal, concentrically laminated portions, which is but another form *en masse* of the polygonal columns; and in the mass, on its precipitous or eastern face, frequently presents a great cuboidal structure, similar to that seen on the precipitous side of Malabar Hill.

Following the outer side of the ridge at its base, from Dharavee Point along the narrow slip of sand which here separates it from the sea, we find it falling back a little on approaching the fishing-village of Woogtun, and after a little more than two miles, faced to seaward, as before stated, by another ridge, which, beginning in a bluff-head close to this village, we will call "Woogtun Point."

Woogtun Point is scarped on its northern side, and here presents a clear section, in which we can see the long columnar structure (30 feet ?) resting perpendicularly on a sedimentary formation ; the whole having been tilted up on the eastern side, so that the columns slope slightly towards the west, and the strata dip in the same direction. The basalt is the same as that of Dharavee.

Here the thin and parallel strata of the sedimentary formation which are uncovered by the basalt, spread over a large area of the shore between high and low-water mark, where they become lost under the sea ; but sloping towards the west, of course only show their edges. In one part of these strata, near the basaltic columns, there are some thin layers of dark blue shale, very much like the carboniferous kind which is found in the sub-trappean Sedimentary Formation of Bombay, while others are distinctly gritty, but most are argillaceous. I could not discover, in my hurried examination, organic remains in any of them. Here and there they are very much contorted, and in some places are intruded and intercalated by volcanic breccia, the fragments of the breccia having evidently been derived from the sedimentary strata through which the volcanic effusion has come.

In this columnar basalt, resting perpendicularly on the sedimentary strata, I could not possibly fail to see the equivalents of the black basaltic, seaward ridge resting on sedimentary strata in Bombay, notwithstanding the difference in colour and structure of the former.

On ascending the point, and walking along the ridge leading from it towards Gorae, the edges of the sedimentary strata in long wavy lines, as the tide was out, met my eye all along the shore, dipping westward under the calm sea, up to another little point, about a mile from the last, where again, a scarp towards the north showed me a similar section of the columnar basalt resting upon the sedimentary strata, to that at Woogtun, but smaller. Throughout this part of the coast, the intrusion of the volcanic rock has gnarled these strata into all kinds of tortuous forms ; torn them to pieces, and, agglomerating their fragments, has thus formed many little islands, whose toughness appears to defy the action of the waves, and render the coast terrific of approach to the mariner.

The ridge now falls back a little, and gives place to a cocoanut grove faced to seaward by a long strand, which leads on to Goraee. I followed the ridge to its extremity near Tuljun, and found it still to consist of the same light-coloured basalt as at Dharavee Point.

Passing over the villages of Goraee and Koosa, where isolated portions of this tract again appear, for the ridge is no longer continuous, we come to the portions of it at Malar and Versova respectively, both of which present the light colour and columnar structure of the basalt of Dharavee Point, but with this difference, viz. that, on inspecting a portion of the rock closely, we find that its colour is now leaden green, its structure less granular and more compact, and the rectangular crystals, which are scattered throughout it as in the Dharavee rock, instead of being ferruginous, are whitish and felspathic, although here and there still passing into brown iron-ore, which gave me the explanation of its pseudo-morph at Dharavee. In fact, the structure of this rock, with its white rectangular crystals of felspar, now nearly approaches that of red porphyry.

Lastly, pursuing this ridge southwards, we arrive at Danda, which is about five miles from Versova, where again the ridge appears, and where I had hoped to have found the leaden hue of the Versova rock gradually passing into the black one of the basaltic rock of Bombay, which I knew to be continued into the island of Salsette a little further on, viz. at Bandora Point, the most southern extremity of Salsette. To my disappointment, however, I found the rock of the ridge as black as jet; identical in colour and tabular structure with that forming the outer ridge of Bombay, and so it continues all the way on to Bandora Point; but it was still uplifted towards the east, scarped in this direction, and presented the brown Freshwater Formation cropping out from its base, charged with the well-known *Cyprides*, even at its commencement at Danda.

Thus far I was foiled in my attempt to trace the white basaltic rock of Dharavee, by colour and structure, into the black basalt of Bombay, although its nature and relations to the freshwater strata showed it to be a part of the same volcanic formation. Much, however, of the black rock is polygonally columnar on the surface in many parts of the tract close to the sea in the island of Bombay, and an accumulation of specular iron-sand was found by Dr. Leith in Back-Bay inside Malabar Point, as it is found, but to a greater extent, just inside Dharavee Point.

It is true that I am now giving the result only of a hurried examination of this basaltic ridge, and therefore, may have passed over many

other points, which would have satisfactorily graduated the light colour of it at Dharavee into the black one at Danda and the southernmost part of the island of Salsette; but we have still another portion of this basalt here to visit.

Leaving Danda on the outside of the island, and falling back eastwards or inland upon the village of Coorla, about four miles from Danda, we again come upon a ridge of the light yellow-coloured, columnar basalt, commonly called in Bombay "White Trap." This is chiefly observed close to the creek on the eastern side of the village, where too, again, the mass has been uplifted towards the east, and the columns slope towards the west. But there is this remarkable in it, viz. that the light yellow colour may be seen passing into the common blue colour of the trap in Bombay, even in well-selected hand-specimens; while the ridge may be traced southwards into blue trap on the opposite side of the creek, where its southern point again, is opposite the termination of the inner ridge of the island of Bombay at Rewa Fort, which is the northern termination of the blue-trap of Bombay.

Now then, as the white columnar basalt at Coorla passes into the blue trap of Bombay, and the black basalt of Danda in Salsette, which is the same as that in Bombay, may be safely assumed to be a continuation of the white columnar basalt of Dharavee Point in the northernmost part of Salsette, so it follows that, the white basalt, the blue trap, and the black basalt are all parts of the same volcanic effusion. Why they should differ so much, I am unable to explain, but in all Plutonian tracts this is a common occurrence. White and red granite may be seen passing into each other without line of demarcation. But while all these three forms of this tract are so different in appearance, they *all cover conformably* the strata of the Freshwater Formation.

We have now to return to the seaward margin of Salsette, to witness another deposit. This is the Shell-concrete which forms the Esplanade of Bombay, and is described in my Geology of that Island. It is to be seen along the coast raised some (6 to 8) feet above the level of the sea at highwater, and frequently presenting a scarp which at once borders the upper part of the beach and limits in this direction, the cocoanut groves, which, on the other hand, are as good an indication of the extent of the Shell-concrete generally, as could be wished. Thus, the lower three-fourths of the coast of Salsette present throughout, an almost uninterrupted band of these trees. At Malar, too, where there is a creek, the elevation of the Shell-concrete on the inner side of the point has exposed a bed of Blue Mud beneath, similar to that under the Shell-concrete in Bombay.

Lastly, we have to notice the remnants of Blue Trap in Salsette generally, and suffice it to state that, this occurrence is very frequent. The tracts which I have seen are all very small, and in the midst of the Volcanic Breccia; sometimes forming small mounds, and sometimes (as a little to the west of Bandoop) the crests of high hills. In all instances the structure is more or less granular and crystalline, with brown specks which, together with great toughness, indicates that it has been exposed to the influence of great heat. There are no ridges of fresh blue trap as in Bombay, and no extensive tracts even of that which has been just described so far as my observation extends, but this, it should be remembered, has been very limited.

Summing up briefly, then, the geological products of Salsette,—we have the great mountainous tract composed of Volcanic Breccia imbedding here and there masses of compact Blue Trap, and portions of the subtrappean Freshwater Formation of Bombay, which proves that, it was a subsequent effusion to the columnar basalt of the outside of the island and of Coorla; (that basalt being now identified with the “trapito-basaltic” tract of Bombay, which appearing in masses, in the Volcanic Breccia where the latter is in contact with it, has therefore evidently had these masses torn off from it;) a basaltic ridge on the outside of the island, whitish and columnar in the north, black and tabular in the south, overlying conformably in both localities the Freshwater Formation. And lastly, the Shell-concrete underlaid, in some places, by the Blue Clay of Bombay. So that, in fact, while the islands of Salsette and Bombay are of the newer geological products, and therefore, belong to the same category, those of Trombay, Elephanta, and Carinja are composed of the old trappean beds of the Deccan.

It is, however, difficult in all instances, as in the Blue Trap of Butcher’s Island and on the western shore of Trombay, to say positively, whether it originally belonged to the old, mainland beds, or, to the new ones of Bombay and Salsette, on account of the altered state by heat of the fragments of the beds of Bombay which are in the Volcanic Breccia, making them look like the older formations. Hence, in Salsette also, it becomes almost impossible, in our present state of knowledge of the geology of that island, to say, which of the beds of trap belong to the old, and which to the newer formations. There are also many parts of the watercourses in Salsette where dykes of the black-basalt are exposed, especially along that leading to the Vihar Lake from Coorla, and afterwards, in those crossing the path to the Caves of Kanheri. How far the geological type of Bombay and Salsette may be continued northwards has yet to be shown.

The island of *Bassein*, however, which is situated to the north of Salsette, does come within the area of volcanic disturbance that destroyed the continuity of the Western Coast of India at this part and fissured it into the islands abovementioned, and it is the only remaining one which I have not geologically described; but time has not permitted of my visiting it for this purpose, and therefore, it must be left for another opportunity.

There are yet, however, three other little islands that I have to notice here in connection with our subject, viz. *Oyster-Rock* and the islands of *Henery* and *Kenery*. The former (on which a battery is now being built) is situated close to the southernmost part of Bombay, viz. Colaba, and is composed of the Volcanic Breccia; but unlike Cross-Island, Sewree Point, and Antop Hill, which occupy a similar position geologically, on the eastern side of the island of Bombay, it still retains its brecciated form most evidently, while that of the other three places mentioned, is almost lost in the homogeneous, black, jaspideous rock into which a greater heat has transformed it.

The islands of *Henery* and *Kenery*, which hardly belong to the estuary of Bombay, being situated out of it, and some little way to the southward on the coast, though always seen on entering Bombay Harbour, are therefore mentioned here. That of *Kenery*, which is the outermost and largest, is, according to a specimen of it brought to me by a friend, composed of a fine, dark, crystalline, sparkling, granular greenstone, apparently belonging to the traps of the Deccan, from which I also infer that its little neighbour, viz. *Henery*, is of a similar composition.

Discovery of a Portion of Pegmatite in a Basaltic Dyke in the Island of Carinja. By H. J. CARTER, Esq., F.R.S.

To this discovery I have already alluded in describing the geology of the island of Carinja, where I stated that I should return to it more particularly under a separate head. My object in so doing is to bring the question of the source of the *débris* which is contained in the Volcanic Breccia of the islands of Bombay and Salsette under consideration, especially in connection with the presence of this portion of Pegmatite in the basaltic dyke of Carinja.

In the month of January last (1861), while examining the geological structure of the mountain called "Great Carinja," I noticed near a basaltic dyke situated in its north-eastern angle, or that part nearest the village of Ooran, a number of pieces of whitish rock, which formed such a contrast with the black-basalt of the dyke and the

brown earthy decomposed trap on both sides of it, that, for the moment, I thought they must have been brought there from a distance. However, my attention having been directed to the part where they were most plentiful, I at once saw that they came from a portion *in* the dyke. The dyke was about two feet broad; could be traced for several hundred feet about N. and S.; stood up in places like a low, narrow wall amidst the decomposed trap, and was composed, as before stated, of black-basalt. The fragment of Pegmatite in the dyke was about the same width as the dyke, composed of large white and pink crystals of felspar, with portions of hyaline quartz, and, I think, a little white, glistening chlorite in some parts. At first, I thought it was the end of a vein of Pegmatite, but on carefully digging round the dyke at this part, and exposing the whole *in situ*, I afterwards found it to be an isolated fragment of this rock. Some parts of it were white and pulverulent, while others were solid and fresh, and so hard and undecomposed, that in the fracture, no doubt could be entertained of the nature of the rock. It was somewhat tinged greenish at the circumference by contact with the black-basalt, but this colour did not extend deeper, nor were the two rocks at all amalgamated. No doubt now remained in my mind that this was a fragment of Pegmatite which had been brought up with the basalt.

This fact having been established, at once corroborated Dr. Leith's discovery of a portion of *Diorite* in the Volcanic Breccia near Antop Hill, in the island of Bombay, to which I have alluded in my Geology of that Island; and, in my "Summary of the Geology of India," under the head of "Volcanic Breccia,"—have assumed that, much of the *débris* of this formation, besides containing portions of the sub-trappean fresh-water formation of Bombay, (identified by their fossil remains,) consisted also of *débris* of the provisionally called "Oolitic" sandstones and shales beneath the trap. Still, the altered and decomposed state of these fragments, and the indistinctness of Dr. Leith's portion of *diorite*, from the blackness of the Volcanic Breccia in which it is imbedded, rendered it very desirable that an unequivocal specimen of rock, brought up from below the trap, should be found. This has now been supplied by the portion of Pegmatite abovementioned, specimens of which are preserved in the Society's Museum.

Aided by this single fact, then, we may account for the greater part of the enormous quantity of *débris* which is contained in the Volcanic Breccia composing the hills in the north-eastern part of the island of Bombay, and all the mountainous districts in the island of Salsette, without having to recur alone, to the Lacustrine Strata which have been shown to underlie the basalt of Bombay and Salsette, although we have

sufficient data now to show that they also once formed a continuous series of great extent over this part of the Western Coast of India.

Discovery of more Organic Remains and Minerals in the Trap of Bombay. By Dr. LEITH.

Rana.—In the month of June 1861, Dr. Leith presented to the Society a piece of carboniferous shale, with the impressions of Frogs' feet on it, which he had found at the "Sluices," among the *débris* of the sub-trappean Freshwater Formation which had been dug up to form the outlet of the main-drain of Bombay into the sea at this point. Comparing the size of the impressions with those made by *Rana Leschenaultii* now living in Bombay, Dr. Leith thinks the body might have been about one and half inch in length, and therefore, could not have been made by individuals so small as *Rana pusilla*.

Cyprides, Pyroxene, &c.—On examining portions of the thin stratum of the Freshwater Formation which is exposed in the great scarp of blue trap in the quarry of Nowrojee Hill at Bombay, Dr. Leith found foliated *Pyroxene* in black rhombic crystals, about one-fifth of an inch in diameter on *Prehnite*; also *Chabasite*, *Laumonite*, and *Dodecahedral calcspar*; together with portions of the brown, sedimentary strata bearing the casts of *Cyprides*.

This thin stratum of the freshwater formation has 90 feet of blue trap, by measurement, above it, and about 40 feet below, which rests on the Volcanic Breccia also containing large fragments of the Freshwater Formation; the stratum between the trap being about 2 feet wide, and the whole scarp about 600 yards long. Wherever the trap comes in contact with the freshwater strata, there is always a great development of the trappean minerals. The presence of the casts of *Cyprides* here leaves no doubt of the nature of this thin stratum, and the formation to which it belongs, and from which it has been raised into its present position; for there is no gradation of the lower trap into it, as there would have been had it been deposited on it gradually. Soon the hill of trap in which it is situated will be all quarried away, when nothing but this record may remain of the facts above stated.

The raised portion of this stratum of the Freshwater Formation between two such thick beds of trap suggests the question, whether the whole of the Freshwater Formation may not originally have been deposited on some rock below the trap, and afterwards raised into its present position, since, in no place has it as yet, been found to rest on the trap with the usual appearances of having been deposited there.

Section of the Trap in the Western Ghauts. By H. J. CARTER, Esq.,
F.R.S.

On a cursory examination of the "Bhore Ghaut Incline" cutting, which extends from Lanowly Wood (2,027 ft.), a little beyond Khandalla on the top of the Ghaut, to the bottom in the Concan (196 ft. above the sea), a little to the north of its upper end, so that it traverses the scarp obliquely (for upwards of 15 miles), I could observe nothing but amygdaloid trap, chiefly of a blue colour. Here and there it is less amygdaloid, and therefore more compact; this is particularly the case just below the lower or Great Viaduct.

After passing the great earthwork below the last tunnel, and therefore, close upon the level of the Concan, a large bed of porphyritic trap (black basalt, with tabular crystals of glassy felspar) occurs; but even this is capped by amygdaloid trap apparently all the way into the Concan.

This porphyritic basalt is remarkable for the number of geodes it contains, and therefore for the fine specimens of zeolitic minerals it has yielded. Here it is remarkable also for the quantity of "green-earth" which accompanies it, and which exists in large masses between the decomposing boulders of the rock, sometimes two or three feet in diameter, and at others diminishing to the breadth of the smallest vein. It is frequently too, of stony hardness, so that sometimes it appears to be an original formation rather than the result of decomposition of the porphyritic masses which it separates. The colour is very fine in some places, and from thence it is removed by the natives for a pigment. When put in water, it crumbles and breaks down after the manner of clay. There is also a red clay, intercalated between layers of the trap a little above the great earth-work, which appears to be merely the same kind of material, with the oxide of iron of a red instead of a green colour; this transition, in colour, of "green-earth" being very common.

Just below the "Reversing Station," (1,631 ft.) which is near the top of the Ghauts, I also observed a bed of this porphyritic rock. I did not see any great difference between the basalt at the extreme top of the Ghauts and that immediately beneath; perhaps it was a little blacker, more compact, and less amygdaloidal, but I saw no distinct bed of "overlying basalt": the surface rock passed into the rock beneath without any line of demarcation that I could discover; but more extended observation than I had time to make is here required, to determine satisfactorily the exact characters of the last layer of trap upwards.

Although the amygdaloid trap is for the most part of a blue colour, still some beds are more or less red, brown or black. It is the greater hardness of some beds than others too, which, after becoming weather-

worn, gives the stratified appearance to the scarps of the Ghauts and mountains of the Concan; but, of course, the real colour of the rock cannot be seen until arriving at that depth which is beyond all decomposition. Here it is, as above stated, for the most part blue; while for the most part also where it is of any other colour, it is more or less decomposed.

What relation the porphyritic basalt bears to the beds of trap is not wholly known. No doubt it presents itself in dykes in some places; but it is very common both above and below the Ghauts, and with every sort of base as to colour and hardness, basaltic and trappean. Colonel Sykes mentions beds of it in the hill-forts of Hurreechundurghur (4,000 ft. high) and Poorundhur; while the most beautiful specimen I have seen came from a dyke crossing the railroad a little beyond Tanna in the Concan. The base of this is fine, compact, intensely hard and black basalt, imbedding large, thin, tabular crystals of glassy felspar; some of which have a rich brown red, and others a green colour like olivine.

During the cutting of these railways through the Bhoire and Thul Ghauts, geodes have been met with containing, perhaps, the largest crystals of the trappean minerals that have been yet found. A fine collection of these may be seen in the Government Economic Museum at Bombay, where, besides the common colourless forms of *Apophyllite*, may be observed the delicate sea-green and pink varieties, of great size and exquisite beauty; red and green *Heulandite*; *Stilbite* in immense masses; the hexatamous form of *Apophyllite* and *Trihedral Quartz*.

Discovery of Coal Deposits in the Lyneah Valley, Sinde. By Captain F. PHILLIPS.

We received the first specimens of coal from these deposits through Colonel Turner in June 1857. They are situated in a valley called "Lyneah," about twenty-eight miles north-west of Kotree, on the Indus, and about thirteen west of this river. (See App. p. xxxvi.)

Subsequently, a section of the sides of the valley, as well as one of a shaft sunk there, were forwarded, with specimens numbered in accordance with the sections, by H. Inman, Esq., who superintended the work. They are as follows:—

SECTION A.

For the sides of the Valley from above downward:—

- " 1. Nummulitic Limestone (thick).
2. Ferruginous Clay (thin).
3. Oyster-beds.
4. Gypsum (selenite) in sand.
5. Variegated beds of sandstone (loose)."

SECTION B.

For the shaft in the Valley, from above downwards :—

Alluvium.

- “1. Light sands, mixed with *débris* of surrounding rocks .. 16 ft.

Clays, Marls, &c.

- | | |
|--|----|
| 2. Variegated clay, streaked with red..... | 5 |
| 3. Mottled clay | 12 |
| 4. Gravel | 4 |
| 5. Variegated marl (sand and clay mixed) | 16 |

Sandstone, Shales, &c.

- | | |
|--|---------------|
| 6. Ferruginous sandstone | 4 |
| 7. Grey sandstone, dark below | 6 |
| 8. Shale | 2 |
| 9. Coal | 1 |
| 10. Shale | $\frac{1}{2}$ |
| 11. Coal | 2 |
| 12. Shale | 3 |
| 13. White sandstone | 7 |
| 14. Reddish ditto..... | 8 |
| 15. Grey ditto | 6 |
| 16. Compact ditto (upper part yellow ; lower, variegated).. | 14 |
| 17. Carboniferous shale (impressions of plants). Over this water came in, and stopped the work.” | |

In these sections, dated 22nd January 1858, Mr. Inman shows that Section A, as above stated, lies unconformably on Section B, whose strata “dip 15° E.”

In the specimens of Section A, I recognise the yellowish white limestone of Hydrabad charged with *Alveolina*, *Orbitolites (complanata ?)*, and the casts of bivalves which belong to the Nummulitic Series.

The Ferruginous clay No. 2 is sandy, and contains in its lower part an abundance of *Operculinæ*, like those found in a similar deposit of the same series, and similarly situated at Ras Ghissa, a few miles south of Muskat in Arabia, just opposite Kurrachee. I also observed a similar deposit at Jerruck in Sind, on the Indus, which is near the Lyneah Valley.

Then comes No. 3, a deposit of *Ostracean shells*, and bivalves, of the kind also seen at Muskat and Jerruck.

And then No. 4, “Gypsum” in sand, also seen at Jerruck similarly situated, but at Muskat it is calcspar.

“Variegated sands,” viz. No. 5, also form the base of the section seen at Muskat, below which comes a conglomerate there, resting on diorite and serpentine rocks, of which it is chiefly composed.

contents of it to the Medical and Physical Society of Bombay in two "Papers" which were published by them in 1860.*

While thus engaged, he also corresponded with me from time to time respecting his geological discoveries, and ultimately sent me all his collections for examination. He has not, however, written a separate account of his geological observations himself, and therefore, all that I propose doing here is, to give the result of a comparison of his geological sections in connection with the specimens actually obtained from the strata which furnished these sections and which specimens he sent me for corroboration.

The sections are evidently referrible to three distinct periods, viz :—

1st.—The Nummulitic Series.

2nd.—The Cretacean (?) Series ; and

3rd.—An evolution of serpentine, diorite, and trappean rocks.

Among the fossils of the Nummulitic Series are, *Operculina*, *Assilina*, *A. exponens* (a very large variety (?)), *A. obesa* (n. sp.) *A. spira*, (*N. spira*), *N. perforata*, *N. Biaritzensis*, *Alveolina elliptica*, and *A. meandrina* (n. sp.), *Orbitoides dispansa*, (and varieties, particularly an asteroid one if not a new species, hence provisionally called *A. asterifera*), *Orbitolina*, &c., for further notice of which see my "Paper" on Foraminifera, p. 31 of this Number. Also since this was written, portion of a deposit densely charged with large specimens of *Orbitolites Mantelli* (Cart.), *Heterostegina* and *Cycloclypeus*, to which deposit I shall more particularly allude hereafter. Add to these some *Echinodermata*, and the casts of bivalve and univalve shells, common to the Nummulitic Formation in Sind.

Among the fossils of the Cretacean (?) Series, we have :—Echinodermata (*Pygaster*), Belemnites, Ammonites, Ceratites and Orthoceratites.

And among the Plutonic Rocks—serpentine with pinch-beck diallage, and large crystalline diorites ; bronzite approaching to labradorite ; and trap-amygdaloid with zeolites and mica.

Let us now turn our attention to the groups of strata in detail as they lie, in which these fossils were found, prefacing them with a Recent Formation observed more particularly in the valley of Kuttringal, which I have not mentioned, but which we shall insert under this head.

* "Topographical and Geological Sketch of the Province of Sharawan, or Northern portion of the Table-land of Beloochistan," and "ditto of a Portion of the Province of Jhalawan and the Eastern Division of Mekran." Trans. Bomb. Med. & Phys. Society, No. VI. N.S., pp. 1 and 45, 1860.

Recent.

	Feet
Conglomerate of nummulitic limestone, sub-crystalline limestone and loose flints.....	50
Sandstone.	
Clay.	

Nummulitic Series.

No. 1. Bluish limestone	20
„ 2. Nummulitic limestone (massive)	10
„ 3. Argillaceous limestone (laminated, purple, red, chocolate)..	40
„ 4. Nummulitic limestone (massive)	10
„ 5. Dark limestone (a few feet).	
„ 6. Sandstone (white crystalline)	12
	<hr/> 92

Cretaceous Series.

No. 7. Fine limestone (compact, white, with tabular layers of porcellaneous flint).....	1000
„ 8. Argillaceous limestone (laminated or shaly), coloured; veins of iron-ore; heavy-spar in spheroids (<i>Tethya</i> ?); ammonites, &c.	
„ 9. Dark blue limestone, &c., with lead-ore (galena and carbonates), heavy-spar	2090

Turning our attention first to the Nummulitic Series, we find Dr. Cook mentioning this from the Dasht-i-bedowlut close to the valley of Quetta,* in the N.E., to the end of his travels in the valley of Mushka, a little north of Bela, on the S.S.W. of Kelat. At times it is found resting on Serpentine and Diorite rocks, apparently conformably, judging from the character of the strata which exist between the serpentine and the nummulitic deposits, as at Juree (p. 40, Med. and Phys. Trans. *l. c.*), and the deposit of *Orbitolites Mantelli*, &c. at Nal (p. 71). Again, at other times, it appears to rest conformably on the “white and red limestone,” as at Gager (p. 77); and constantly *over* this white and red limestone, (which is the same with the “fine limestone compact white,” No. 7 in the above series) so well seen in the valley of Khozdar, at the Halwae range, Siah-sir and Kharan Farosh (p. 63 *et seq.*). There is some slight and unimportant difference in the detail of these sections, but they generally seem to pass from *limestone* above, downwards into *clay*, and then *sandstone*, which is the case in the series above given from the Kaman Farosh (p. 65). Sometimes the “sandstone” appears to be wanting, and a “nummulitic” stratum to lie “conformably” on the “white and red” limestone, as

* “Geological Report of a Part of Beloochistan.” Trans. Med. & Phys. Soc. Bombay, No. V. p. 113.—This contains cursory geological observations on his way from Dadur through the Bolan Pass.

in the section of the Halwae range and at Juree. The specimens of this "red and white limestone" sent to me show that, it is of fine, compact, lithographic structure, and therefore, probably contains a little clay, which is indicated by its passing into a series of argillaceous shales, while the great slabs of flint with which it is intercalated have more a porcellanous, than a flinty character.

All this agrees strictly with what is found on the south-east coast of Arabia, where the Nummulitic Series seems at one part to be deposited conformably on the fine, white, compact limestone strata of the cretaceous series, and at others, as at Muskat, and in the island of Masira, conformably on serpentine and dioritic rocks. Indeed, the specimens of the latter sent to me by Dr. Cook are identical with the Arabian ones. Thus, I am inclined to infer that, the eruption of the serpentine and diorite rocks occurred in some places at the end of the secondary or cretaceous period; while at other places, the sedimentary deposits passed from one period into the other without disturbance, and therefore the nummulitic limestone is found to overlie conformably the white and red "limestone," sometimes even without the presence of a siliceous, or even the more subtle, argillaceous deposit.

The late and lamented Mr. Loftus (who died too soon for the interests of the Geological Survey of India, to which he was latterly attached), in his *Geology of the Turko-Persian Frontier*,* frequently alludes to a similar fact which evidently puzzled him at first, but which he was subsequently able to clear up by a section in the Bakhtiyari Mountains, (p. 284, and section xi.,) which are but a little north of the parallel of Kelat, and about 660 miles west, near the top of the Persian Gulf.

To quote one instance (p. 285), he observes :—

"In this section, then, we have between the sphærolitic limestone and the Nummulitic Rocks a series of blue marls and cream-coloured limestones, the latter passing imperceptibly into the Nummulitic Rocks.

"If we had only this section, we should be at a loss whether to consider the marls and cream-coloured limestone as belonging to the cretaceous or nummulitic rock. Fortunately, we have elsewhere sufficient evidence of organic remains to prove that they must be undoubtedly classed as cretaceous. It is very remarkable, however, that in no instance have I met with any admixture of chalk and nummulitic fossils, although a gradual transition certainly takes place in lithological character."

The "cream-coloured limestone" is described as fine, compact, and lithographic in its strata, intercalated with "tabular beds of milk-

* *Quart. Jour. Geol. Society*, Vol. XI., p. 247.

white or blackish flint, or crystalline, arenaceous, sonorous bands;" and will be seen to correspond to Dr. Cook's "compact, fine-grained, red and white limestone, interleaved with slabs of flint or chert" immediately underlying *his* nummulitic series, and sometimes in contact with a stratum bearing nummulites; also passing in like manner into argillaceous shales below, bearing Ammonites, &c. as in the case with the "cream-coloured" limestone on the Turko-Persian Frontier. In fact, one of Dr. Cook's specimens, labelled "Khozdar," but described, I think, as occurring near the village of Nogai (p. 35), shows plainly the passage of a foraminiferous deposit (which, by the specimen, I know to contain the small striated nummulite that I have called *Nummulites Kelatensis*, *Orbitoides dispansa* (the asteroid variety), *Alveolina elliptica*, *A. meandrina* (n. sp.) *Orbitolina* (conical), and *Orbitolites complanata* (mihi),—all of a diminutive kind), into a fine lithographic limestone, like that which he designates by the term "red and white," and which, if I am right, in the place where he has described it in his paper, is this limestone. Hence, it becomes doubtful also, where the Nummulitic Series ends downwardly, about Kelat. I have often alluded to this remarkable deposit in my paper on the "Structure of Foraminifera, &c." (*ante*); but, until receiving the specimen to which I have above alluded, did not distinctly observe the *Orbitolites*. Thus, at the very introduction of the Nummulitic Series, all the foraminiferous forms almost which are so largely developed in it afterwards, appear to be foreshadowed in this bed. Dr. Cook often met with this deposit of minute Foraminifera, and therefore it probably has a wide range, a fixed position, and a valuable and determinative character, whatever that may be. At present it seems to mark the lower part of the Nummulitic Series.

There are many other points of resemblance between the description of the Nummulitic Series in Beloochistan given by Dr. Cook and that given by Mr. Loftus of the same series on the Turko-Persian Frontier, to which I need not here allude, but would refer the reader.

Let us now go to Dr. Cook's "Cretaceous Series."

With the exception of the fossils found in the valley of Kelat, only one instance is mentioned where an Ammonite was obtained from a recognised position out of this valley, viz. from the "coloured, argillaceous, shaly limestone," into which the "superincumbent," compact limestone with flints passed at the Kaman Farosh (p. 66). Of this, the "red and white" limestone, Dr. Cook states (p. 102) as follows:—

"Its distribution is most extensive throughout the country. We met with it at Baghwana forming hills 1,000 feet high, at Khozdar

2,000 feet, and westward, along the valley of Mushka, where it formed three separate hills (in the floor of the valley) from 300 to 600 feet high. Its lower strata at Khozdar passed into argillaceous beds, in which I found an Ammonite of the same species as one of those found at Kelat. The amount of flint (of a cherty nature) it contains varies. At one place, I estimated the slabs to form one-sixth of the whole thickness."

We now have to return to the valley of Kelat, in which there are strata of fine, white, grey, compact, argillaceous limestone, abundantly charged with specimens of many species of Ammonites, Belemnites and one species of Orthoceratite, "all together," with Echinodermata of the genus *Pygaster*, &c. The argillo-calcareous shales, in which these fossils are found, are, according to a section sent me by Dr. Cook, backed on an incline, by white limestone strata, bearing *Alveolina* and *Orbitolina*; above which are strata bearing nummulites, while the whole rests in an elevated position on trap, which appears to have been the upraising agent. Further than this it is impossible for me to go, and Dr. Cook left Kelat before he had time to complete the section.

He states that a stratum of the deposit of diminutive Foraminifera above mentioned (as verified by the hand-specimen) crops out *below* those containing the Ammonites, &c. in another locality, also that, in another part of the Kelat Valley, it is seen cropping out from the "red and white" limestone; but the whole of the section is so incomplete from Dr. Cook not having had time to work it out, that all that appears probable to me is that, the strata bearing the Ammonites, &c. in the valley of Kelat which are backed by nummulitic strata, as above mentioned, and underlaid by trap,—are part of an anticlinal axis, formed by the intrusion of the trap, which has thus brought the ammonitiferous strata to the surface in the midst of the Nummulitic Formation.

How Orthoceratites, which are considered to be not younger than the Trias, come to be imbedded with Belemnites, which, according to d'Orbigny (Cours Élément. &c. de Geol. Strat.), do not appear until the commencement of the Jurassic period; and how nummulitic strata approach so near to Ammonites, which although apparently of cretaceous age, which cannot, from the presence of *Pygaster*, (also according to d'Orbigny,) be younger than the middle (Cénomanién) division of this period, I leave Geologists to explain, or further discoveries to elucidate; contenting myself here with merely stating the facts as given by Dr. Cook, and that, the lithological characters of the rock in which the Ammonites, &c. are imbedded corresponds closely with the description of the fine, compact, argillaceous, lithographic limestone in which the

late Mr. Loftus found his cretaceous fossils, viz. Ammonites, Turrilites, &c. on the Turko-Persian frontier.

Of the fossils from the Ammonitiferous strata sent to me by Dr. Cook, the following descriptive characters are nearly all that their state of preservation permits of being given:—

Orthoceratites.—One species. There is nothing remarkable about this except that the segments are circular, about one-third longer than their posterior breadth; the septa simple, horizontal, and convex posteriorly; the siphon marginal, and the size of the largest segment (sent to me) three inches in diameter, while the total length of the largest specimen is estimated at from three to five feet by Dr. Cook, who had good opportunity of judging from the great number of specimens exposed in the strata, although he states that, he could not find one “perfect.”

Nautilus.—One little specimen, with septa sigmoid and siphon sub-ventral.

Ammonitides, 1st Tribe.—*Ceratites*. A fragment, showing that the test was much compressed, angular at the margin, umbilicated, and the septa crenulated in large divisions, whose lines again are sub-crenulated, but not branched. Something like *C. semipartitus* (Pictet, Pl. lii. fig. 8), but with *all* the sinuous line sub-crenulated. 2nd Tribe.—(Four species at least) viz. 2 belonging to the group of *Cristati*, d’Orb., 1 to *Capricorni*, deBuch., and 1 to *Heterophylli*, d’Orb. *Crioceras* and *Schaphites*. Fragments.

Belemnites.—Three kinds. One conical, one-grooved, towards the point only (*Acuarii*, d’Orb. ?); another compressed, and two-grooved, one on each side laterally (*Clavati*, d’Orb. ?); and the third, one-grooved, groove not extending to the point (*Canaliculati*, d’Orb.).

Echinodermata.—Two specimens. One sub-circular, pentagonal, slightly concave posteriorly. Oral orifice, central, small; anal orifice above the margin, wide below, which is the only part of it remaining. A row of large tubercles (which bore spines) on each side the ambulacral spaces, as in *Goniopygus*. The other specimen belongs, I think, to the same genus, but is more pentagonal, and not concave behind, where there is also no trace of anal orifice.

The first of these species is a *Pygaster*, from the form and position of its anal orifice, but not from the presence of the large row of tubercles on each side the ambulacral spaces. Then Agassiz states (*Monog. d’Echinodermes*, p. 76), “les *Pygaster* sont le genre qui se rapproche le plus de la famille des *Cidarides*.” There is not sufficient of the test of the second specimen left to say where the anal orifice was, although the inferior surface is pretty evident. The summits in both are gone, and both are

nearly reduced to mere casts, but there is quite sufficient to show what I have stated, and therefore the species may perhaps form the basis of a new genus when thoroughly examined, if they are not allowed to belong to *Pygaster*. They are very different from the *Pygaster* which I found in the cretaceous strata on the south-east coast of Arabia, which is more like that figured as typical of the genus. The best of these fossils will, however, at the request of Dr. Cook, ultimately go to the Geological Society of London, where a satisfactory report on them will, I trust, some day be drawn up and published.

Summing up, then, the fossil-evidence afforded by these shales in the Valley of Kelat, independently of the Orthoceratite:—we have *Ceratites*, which has not been found above the Lower Chalk (Turonien d'Orb.); Ammonites of the group *Cristati*, which following Pictet, are chiefly developed in the Gault (Albien d'Orb.); of the *Capricorni*, all of which are confined to the Lias (Pictet); and of the *Heterophylli*, which extend from the Lias to the Gault (Pictet). *Crioceras*, which is only known from the Lower Green-sand to the Gault inclusive; *Scaphites* from the Lower Green-sand to the Chalk: and *Belemnites*, from the Lias only to Green-sand. While *Pygaster* extends from the middle of the Jurassic series to the Chalk.

So that we might assume for the present that the shales of the Kelat Valley in which Dr. Cook found the above fossils are most nearly allied to the geological epoch of the "Gault" or lower part of the Cretaceous Series.

At the same time, as Dr. Cook mentions an efflorescence of salt upon red clay in the Valley of Kelat, and a similar efflorescence, amounting in thickness to three quarters of an inch, on a stratum of sandstone cropping out in the valley of Rodingo close by (p. 40, *l.c.*),—the Triassic Series, which Dr. Flemming has described (Bengal Asiat. Journ. Vol. xxii. 230) in the Salt-Range about 360 miles north-east of Kelat, may not be far off.

Lastly we come to the "Dark blue Limestone," which Dr. Cook considers to underlie the "red and white limestone," and estimates at "2000" feet in thickness. In the strata connected with this, he considers the lead-mines of the neighbourhood of Khozdar to be situated, and at the Shah Jehan mountain near Banee, in the valley of Greisher, gives the following section of it (p. 74) from above downwards:—

1. Dark blue limestone.
2. Dark grey crystalline limestone.
3. Metamorphosed clay-stone, coloured white and purple.
4. Serpentine rock.

This limestone is fossiliferous, but did not yield any species which were perfect enough for Dr. Cook to recognize.

The specimens of lead and iron ore forwarded to me are accompanied as usual by heavy-spar. The former metal occurs as galena and the red carbonate, and the latter as brown hematite and ochres. The presence of the spheroidal masses figured in his paper at p. 66 *l. c.* which consist of an encrustation of heavy-spar round an organic nucleus, occurring with iron among the shales, which underlie the "red and white limestone," adds to the probability that this spar is also connected with "the dark, blue limestone." In structure, the nuclear or brown part, when polished and placed under a microscope, is so like the structure of Sponge, that, although no spicules can be seen, I can hardly hesitate to pronounce these spheroids to have been a species of *Tethys*.

Having thus, assisted by Dr. Cook, given a short summary of his discoveries so far as his private correspondence, his specimens and his published "Papers" admit, let us now, before concluding, direct our attention for a few moments to that deposit to which I stated, while treating of the Nummulitic Series, I should return more particularly, viz. the deposit of *Orbitolites Mantelli*, Cart. at Nal, (p. 74).

The specimen of this deposit (which I have but lately received) corresponds to the description Dr. Cook has given of it (p. 71), viz. it is composed of thin layers, almost like leaves, which, when examined, are found to consist of *Orbitolites Mantelli*, Cart., (*Orbitoides Mantelli*, d'Orb.) *Cyclocypeus*, and *Heterostegina*.

Of the series of strata in which this bed is situated, Dr. Cook states that, the limestone is in some parts crystalline, and contains no fossils; in others the foliated stratum mentioned occurs; and towards the top much coral, and no foraminifera; while the whole rests on serpentine and diorite rocks, but the union of the two could not be seen on account of the *débris* which covered it.

The largest specimen of *Orbitolites Mantelli* sent is $2\frac{1}{2}$ inches in diameter; the vertical growth $\frac{1}{2}$ inch wide and $\frac{1}{8}$ thick; while the thickness of the brim or horizontal portion does not exceed $\frac{1}{16}$ th of an inch, half way between the centre and the circumference, and but a little more even up to the commencement of the central prominence or vertical growth. The other thin fossil mentioned by Dr. Cook as forming part of the mass is *Cyclocypeus*, in which the chambers are oblong and the specimens not exceeding half an inch in diameter. It hardly differs from the one described by Dr. Carpenter, while the *Heterostegina* is very small indeed, not being more than $\frac{1}{4}$ inch in its longest diameter. All these lie parallel on each other in a softish

yellow argillo-calcareous matrix. At first I thought that the deposit also contained *Orbiculina*, but in this I have since found that I was deceived, viz. by the sections of *Orbitolites Mantelli*, when growing from a very minute central or germ-cell, assuming *at first*, the form of the lines on an engine-turned watch-case, before the rows of cells become cyclical.

In describing *Orbitolites Mantelli* (p. 83 of this No.), which was done before receiving the specimens under consideration, I have alluded to the opinion which I formally held, viz. that it sometimes had an indefinite, thalloid growth, like the polypidom of the Polyzoa, but that now, I believed the form to be always circumscribed or discoid. The expanded, flat specimen, now under consideration, which is only a variety, confirms this view, and points out how the original opinion might be, and was in my case, falsely deduced, viz. from fragments of specimens of the same expanded variety, in which the absence of the vertical growth made the wide horizontal margin (the only part remaining) look like a thin, thalloid expansion.

The chief interest of this deposit is that, in organic remains as well as mineral composition, it exactly corresponds to the deposit at Takah, on the south-east coast of Arabia, midway between Ras el Had and Aden; while there the series rests conformably apparently on fine, white, compact, lithographic, limestone, but further toward Ras el Had, where it contains nummulites, as at the Island of Masira and at Muskat, it rests conformably on serpentine and diorite rocks. I, however, only saw the *Orbitolites Mantelli*, &c. at Takah. In Sind, *Orbitolites Mantelli* and *Nummulites sub-lævigata* are found together in a similar matrix, of which I have a specimen, obtained, I think, from the Hala Range.

As regards the Nummulitic Series, the Cretaceous Strata, and Dark Blue Limestone, together with the presence of trap, serpentine, and diorite rocks,—I see in Dr. Cook's descriptions, and in the specimens he has forwarded to me, great resemblance to what I observed and have described on the south-east coast of Arabia. The dark-blue limestone of Ras Furtak too, in which undoubted cretaceous fossils existed, was strongly charged with iron pyrites; while the specimens of limestone which Mr. Blackwell brought from the Nurbudda, where he found it in connection with a large development of iron (near Tendukira, I think) put me much in mind of the blue limestone of the cretaceous series on the South-east Coast of Arabia; and this too may also be part of the dark blue limestone bed of Beloochistan, in which Dr. Cook found both lead and iron developed to such a great extent, near Khozdar. The green carbonate of copper discovered by Dr. Cook was chiefly

found in the serpentine rocks at Nal (p. 92). It is also found in the serpentine rocks at Muskat and the island of Masira on the S. E. coast of Arabia. There is chert among Dr. Cook's specimens also bearing green carbonate of copper on the plane surfaces. So at Muskat, there are slight traces of it among the nummulitic strata. In fact, the presence of the serpentine and diorite rocks seems to be accompanied by a slight diffusion of copper in themselves as well as in the sedimentary strata in their vicinity everywhere, in both this part of Arabia and in Mekran.

One point, however, I would notice, viz. that in none of Dr. Cook's specimens have I seen the *Orbitolina*, viz. *O. lenticularis*, which abounds so generally and so plentifully in some parts of the cretaceous series on the South-east coast of Arabia as to form (*e. g.* Ras Fartak), almost exclusively, whole strata a hundred feet in thickness.

Lastly I must testify to the indefatigable exertions of Dr. Cook in pursuit of geological facts in the locality under consideration; his praiseworthy success under the difficulties he must have laboured, and his great intelligence, without which, his private correspondence, his "Papers," and his having transmitted to me his specimens carefully labelled for examination, I could have written nothing of the above summary. Whatever information therefore the reader may have derived from it must be considered due to Dr. Cook.

Remarks on the Geology of Nágpur. By the Rev. S. HISLOP.*

In the "Geological Papers on Western India" there was inserted information on the geology of Nágpur up till 1857. At the request of the distinguished Editor of that volume, I now present the result of more recent researches.

For an account of the Intertroppean Freshwater and Estuarine formation of Peninsular India, I would refer the reader to the Quarterly Journal of the Geological Society, Vol. XVI., page 154, where are given descriptions of twenty-five new species of lacustrine shells from Nágpur; one lacustrine and one landshell from the Narbaddá Territory; thirty-five estuarine shells from Rájámandri, and two new genera of fossil insects, and three species of *Cypridæ* from Nágpur. Allusion is also made to two minerals regarded as new by Professor Houghton of Dublin.†

* Written by Mr. Hislop.

† One of these, heretofore known in India as Green Calcespar, but named "Hislopite," after my friend Mr. Hislop (Dub. Phil. Mag. January 1859), appears to me to be no more a distinct species than moss-agate is of Calcedony; that is to say, the

These are the only specimens from the deposit that have yet been examined. Our fossil vegetables and *Vertebrata* remain for description.

To the fruits there have been few additions since the publication of the Memoir submitted to the Bombay Asiatic Society in 1853. With the co-operation of my friend, Dr. Rawes, one or two new species have been found of the compound fruits, which were believed to belong to the *Aroideæ*, and to approach nearest to the genus *Pothos* or *Scindapsus*. This opinion, entertained by my late excellent colleague, Mr. Hunter, and myself, is concurred in by eminent botanists at home. At the same time the progress of discovery has modified a view formerly announced. Two seeds lying together, which we supposed to resemble Bowerbank's *Xylinoprionites*, have turned out to be only a part of a compound fruit, nearly resembling the *Petraphiloides* from Sheppey. Others exhibit a remarkable similarity to those lately obtained from the Woolwich clay near Dulwich. In a particular spot there was laid bare a considerable number of somewhat spherical seed-vessels, apparently one-celled, and near these, two specimens of a fruit with three large seeds, separated by thin dissepiments, which may have belonged to the order of Palms. In another place was discovered an interesting flat, globular fruit, full of seeds, probably a *Cucumites*; and at Pahád-singha, as well as at Tákli, where most of the other vegetable remains occur, there was brought to light a new species of *Chara*, which I have named *C. elliptica*.

U: same kind of branched, tubular, confervoid structure filled with green-earth exists in it as in moss-agate, and imparts to it the same kind of green colour. We have also green Heulandite among the trap minerals here similarly coloured, but the green-earth is in minute, acicular, fusiform bodies (crystals?), about 1-2800th of an inch long, arranged more or less parallelly and in broken lines and groups, tending only, to a confervoid appearance, though as much like acicular crystallisation. Here, evidently, we have a mere physical combination, while in Prehnite and in the delicate green, and even the pink varieties of Apophyllite, (of which such splendid specimens have been obtained from the cuttings through the trap for the railway here), the colour, apparently derived from the same source (for the iron in green-earth is at one time green, at another red, and at another yellow, with every intervening shade), appears to be diffused chemically, throughout the crystal.

Turning briefly, but to another interesting point connected with this tubular, confervoid structure, which, existing in minerals that have been crystallized in trap-geodes cannot be, as supposed by some, organic remains; we, nevertheless, must be struck with its great resemblance to the branched, filamentous Algae, and I think, at the same time inclined to infer that the law which presides over the development of the form of this mineral structure in Calcedony, &c., may be the same law-of-form which exists generally in the organic kingdom.— H. J. C.

The remains of fishes at Tákli and Pahádsingha consist chiefly of detached scales, some being Ganoidan and others Cycloidan. In the subtrappean yellow limestone of Dongargaum, sixteen miles E.S.E of Chikni, the impression of a fish was found about 6 inches long and 1·8 inch at the broadest part, which must have been covered with cycloid scales, of a pattern that Sir P. G. Egerton had never seen. The same locality yielded the head of a fish about 9 inches long, with a produced muzzle, armed with sharp sauroid teeth, and rows of smaller ones. A fragment of bone, with 21 of apparently the very same smaller teeth, was dug out from the intertrappean of Tákli. According to Sir Philip, the ichthyolite most nearly allied to this is the *Sphyrænodus* of the London clay. In the Dongargaum limestone there was also embedded a portion of a Ganoid fish, *Lepidotus* or *Lepidosteus* (?) which is 6 inches broad, and when perfect was probably 2 feet long. This seems to be the species which has left so many of its scales in the intertrappean of Tákli and Pahádsingha. A separate vertebra of a fish from the subtrappean red clay of Phisdúra, 8 miles E. of Chikni, measures ·7 inch in diameter.

Reptilia.—In my paper in the Geological Journal* I have expressed an opinion that some large bones, found in the clay at Phisdúra, are the remains of Pachyderms. Having since been favoured with the opinion of one well qualified to judge, Dr. Falconer, I am convinced that they are not Mammalian at all, but rather Reptilian. Among them were a portion of a femur, eleven inches broad at the condyles, and several detached cup and ball vertebræ. In the same field with these was picked up a strong conical tooth, serrated on both edges, and apparently worn at the crown; and there was collected an abundance of coprolites of all sizes, from $\frac{1}{4}$ inch to 6 inches in length. The largest is of an oval shape; another nearly as large, but imperfect at one end, reminds me, by its convolutions and straight tapering cylindrical form, of a piece of an *Orthoceratite*. In the intertrappean at Tákli, Dr. Rawes met with a tooth, which in shape and size resembles those of *Megalosaurus Bucklandi*. At the same place small vertebræ and other minute bones, scattered through the deposit, may have belonged to frogs. Here also were embedded the remains of a freshwater tortoise, and in the subtrappean clay of Phisdúra part of a very thick plastron (?) of another species of the Chelonian order.

In the above remarks on our more recently discovered fossils, in order to designate the freshwater strata containing them, I have sometimes

* Geol. Jour. Vol. XVI., p. 165.

been obliged to use the epithet intertrappean, and sometimes subtrappean,—for they occur in both situations. That in both positions the rocks belong to the same formation, no one can doubt, who has examined their respective organisms. My own opinion is, that the intertrappean deposit, whose horizontal narrow zone forms such a marked feature on the escarpment of most of our trap-hills, is the same as the upper part of the strata, which lie at the base of some others of these elevations. The *Paludinæ*, *Limnææ*, and *Physæ*, gathered on the slope of the Tákli range of hills, are exactly the same in species and numerical proportion as those picked up from the ploughed fields adjacent to the foot of the hill at Phisdúra. In the one case, as I suppose, the higher portion of the strata has been elevated by intruding trap; in the other, it continues to rest on the beds on which it was originally deposited. But whether or not this hypothesis of position be accepted, the fact is certain that the subtrappean with shells at Phisdúra is contemporaneous with the intertrappean embedding the same shells at Tákli. They must be included in one and the same formation.

In an able Report on the Central Portion of the Narbaddá District,* Mr. J. G. Medlicott proposes, as a sub-division of the Mahádewa series, an upper group, which, under the name of “Lameta,” he distinguishes from the intertrappean series. In this group he seems to include the subtrappean bone-bed near Jabbalpur.† At first, on the authority of Dr. Spilsbury, I was led to believe that the large bones of that deposit were pachydermatous; and, under an erroneous impression that the large bones from the subtrappean of Phisdúra were also to be assigned to that order, I ventured to point out the agreement in age of the two deposits.‡ It now appears§ that Dr. Spilsbury’s specimen was probably reptilian, and so in Mr. Medlicott’s judgment are the vertebræ mentioned by him from the same locality.|| The bones from Náráyanpur, south of Saugor, are described by Captain Nicolls, their discoverer, in one instance to be “like the head of an elephant’s humerus, 14 inches broad by 11 long;” and in another to be a “vertebra,” one end of which was “concave”¶ like ours, with cup and ball

* Memoirs of the Indian Geological Survey, Vol. II., p. 101.

† Ibid, p. 199.

‡ Geol. Journ., Vol. XVI. pp. 163, 165.

§ Dr. Falconer’s Descriptive Catalogue of Fossil Vertebrata in the Beng. As. Soc Museum, p. 250.

|| Mem. Ind. Geol. Surv., Vol. II., p. 190.

¶ Carter’s Geol. Papers, p. 765.

joints.* Now at all these sites a portion of the remains is colossal, and apparently reptilian. They are infiltrated with silicious matter; and are all from a subtrappean deposit, which at Náráyanpur contains minute *Paludinæ*, *Physa Prinsepii*, and *Unio Deccanensis*, like the clay at Phisdúra and the adjoining village of Koḍbárá. The simple fact that, the bed at all these localities is subtrappean is not sufficient evidence of its identity: for even though the trap may be contemporaneous, yet it may have been erupted over one rock at one place and over another at another. But, when to this fact others are added derived from the fossils,—when it is shown that, the animal remains agree in general character, in size and mode of petrification, then it appears to me, that the evidence amounts to more than a presumption, and would require clear facts of an opposite tendency to throw doubt on it. However, in this comparison of the fossils we are not left to incidental notices of their general character. By the kindness of Dr. Oldham I have had an opportunity of inspecting drawings of the vertebræ discovered by Mr. Medlicott, which would seem not only to have borne a general resemblance to those at Phisdúra, but to have belonged to the same species of animals. I still, then, hold the subtrappean of Jabbalpur to be contemporaneous with the subtrappean of Phisdúra, and as the latter, by means of its shells, can be identified with the intertrappean, so ought the former. Perhaps it may afford an additional proof of the correctness of this conclusion to state that, in the intertrappean at Junyápáni Chouki, five miles west of Nágpur, there was found a phalanx which must have belonged to an animal of as huge dimensions as those of the subtrappean localities, and that the peculiar cycloid scales in the subtrappean yellow limestone of Dongargaum are met with at Chirúr, six miles South of Chikni, along with *Melania quadri-lineata*,—a characteristic intertrappean shell. Of similar import is the fact stated before, that some of the small teeth of the *Sphyrænodus*-like fish from the same limestone have been collected from the intertrappean of Tákli. The depth at which the fossils at Dongargaum occur is a strong point in this argument. The trap-hill, at the foot of which the village stands, rests on a deposit of green clay, which must be about fifteen feet thick. Here and there in the clay is a thin stratum of fibrous limestone, or a layer of indurated cream-coloured clay, which breaks with a conchoidal fracture, and is sometimes formed into an oval or cylindrical body, like a septarium. About

* For a description of the fossil bones from Náráyanpur, which were sent to the Bombay Asiatic Society by Captain Nicolls, see "Note" at the end of this "Article."
—Ed.

three quarters of a mile N.N.E of the village, and apparently at a lower level than the clay, is the outcrop of yellow limestone, which, as it descends, becomes more and more arenaceous. The limestone, besides ichthyolites, contains a few *Cypridæ* and imperfect vegetable remains.

This leads me to specify the series of beds which I would include with the intertrappean. At Phisdúra, where the Physa-stratum underlies the trap, no good section, I regret to say, has been procured. On Sitábúldi Hill, where that stratum is enclosed in trap, the section from above is as follows:—Nodular trap, seventeen feet; Physa layer, one foot; Trap, at first friable and amygdaloidal, but gradually becoming more compact till about one foot and a half from the base, where it is of a dark olive green, with vesicles and large crystals of calcspar, eighty feet; Sandstone, ten feet, the upper part with occasional concretions of flint and of kunker, but chiefly a crumbling rock, white, with deep red blotches; the lower of a more uniform pale green or grey, and hardened so as to admit of being hewn. In the upper portion was found a *Paludina* not very unlike *P. Deccanensis*, but unhappily now lost; in the lower there was an abundance of carbonized exogenous stems. Under this, the sandstone becomes more argillaceous, and gradually passes into gneiss,—the green base being diversified with white specks. In my own compound, which is at the foot of the hill, it is the mottled portion of the sandstone that is changed into the metamorphic rock. About a mile N.W. of Sitábúldi Hill commences a range of trap hills, which runs west from Tákli Cantonment. Here we see the usual narrow Physa-zone, with nodular trap above and amygdaloid below. For half a mile north of this, at a lower level, we travel over a thin sheet of volcanic rock, on the surface and in the mass of which are found bits of indurated clay, with fruits and seeds, as well as small *Physæ*, &c.; and then we arrive at the outcrop of a deposit, from which, in my opinion, these vegetable-bearing fragments have been caught up. It consists of a green and ash or purple coloured clay, mixed with whitish calcareous nodules, which often contain shells (*Paludina normalis* and an elongatespecies), and are generally permeated in all directions by dendritic markings. This may extend to about 10 feet in depth. Under it lies a soft yellowish sandstone, with kunkeraceous and irony concretions, suggesting a comparison with the yellow strata below the green clay at Dongargaum. Next comes the white sandstone, previously mentioned, with red blotches. This rock I was formerly inclined to regard as part of the Mahádewa series; but on visiting Kámpti quarries lately, I observed a purplish sandstone, which I take to be it, lying unconform-

ably above the Mahádewa,—the former filling up a hollow in the latter, which must therefore have been subjected to previous denudation.

Here, then, we have a well-defined series of rocks, equally distinct from the Mahádewa below it, and the more recent deposits above it. As it is developed around Sitábaldi it may not be complete, for there is reason to believe, that some argillaceous limestone strata, occurring at Junjai Falls near Suit on the Wardhá and other localities in the south of our Province, and probably at Drug and other places referred to by Dr. Voysey in the Rágepur or eastern district, are to be included in the same series. But taking it as it is found in the immediate vicinity of Sitábaldi, it comprehends strata that have been designated by two different names—the “Intertrappean” of Dr. Carter, and the “Lameta” of Mr. Medlicott. If the view which I have presented above be correct, it will be seen that neither of them is as appropriate as could be wished; and therefore I would propose a third, derived from “Tákli” near Nágpur, where are found both the intertrappean and subtrappean strata, that together go to constitute the formation, and where, though the argillaceous limestone is wanting, there has been obtained a richer collection of organisms both vegetable and molluscos, than at any other single site of these freshwater strata in India. The Tákli Series, as I have endeavoured to show in another place, is Lower Eocene.*

Below this follows the Mahádewa series, in which the only fossils yet found are stems, which afford little data for judging of its age. As, however, it underlies the Tákli series, which is situated at the very base of the Eocene, and as similar sandstone with stems rests on the Lower Cretaceous rocks of Southern India, I am inclined to consider the Mahádewa series as the equivalent of the Upper Cretaceous rocks of Europe.†

* Geol. Journal, Vol. XVI., p. 164.

† In the Quart. Geol. Journ. (Vol XVI. p. 181), I have represented Dr. Oldham as having held the opinion, that the Mahádewa series is the equivalent of the Nummulitic Limestone: I ought to have said the Nummulitic Group. This view has been abandoned for some time by Dr. Oldham. At page 165, *ibid.*, I appear to account for his introduction of the term “Mahádewa” by a desire “to supersede the loose designation of diamond sandstone.” All that I meant, however, was, that the introduction of the more specific name ought to have the effect of displacing the other, which had been variously applied by previous authors. But the eminent Superintendent of our Geological Survey goes too far in his protest against my statement, when he declares, that “the identity,” viz. of the Mahádewa Sandstone and that which had been loosely designated Diamond Sandstone, “can only have existed in imagination.” It existed in the writings and sections of no less a geologist

The strata which in our area seem to be next these in downward succession are the ichthyolitic beds of Kotá, on the left bank of the Pranhítá. Here the principal discoveries that have been made have been among the *Articulata*. In the limestone which has yielded remains of *Lepidotus* and *Æchmodus*, the exuviae of insects abound, including *Coleoptera*, *Orthoptera*, and perhaps *Diptera*. Cockroaches seem to have been particularly plentiful in those days, both in individuals and species. Their wing-covers are beautifully preserved; some being of a uniform hue, but others exhibiting the spots of colour which adorned them while alive.

In the bituminous shale, which has embedded *Lepidotus Deccanensis*, *L. longiceps*, and *L. breviceps*, there is found a species of *Cypris* somewhat cylindrical in shape, which also occurs in the limestone, together with a species of *Estheria*, which Mr. Rupert Jones regards as a form intermediate between the larger and smaller forms so common at Mángali. Having been favoured by Dr. Oldham with specimens of the Panchet *Estheria*, referred to by Mr. W. T. Blanford in his very interesting paper, "On the Rocks of the Dámúdá Group,"* I think there can be no doubt that it agrees in every respect with our smaller Mángali form; and as in the Panchet shale there is no appearance of a larger one, which might be liable to be regarded as only the adult state of the smaller, I feel disposed to look upon the two Mángali forms as distinct, though allied species; in which case, the one from Kotá would be a third closely connected with both. The Entomostraca at Kotá are intermingled with the fragments of fishes and insects in the limestone, but they are met with in greatest numbers in some white laminated strata into which the limestone passes. Along with the animal remains above enumerated, the limestone has enclosed a few traces of vegetables, one being a small bit of *Sphenopteris*, and another belonging to the order *Cupressineæ*. Mr. Wall has mentioned an outcrop of these fossiliferous strata at Yetúr, south of Kotá. My collector, Virápá, has observed another at Kátanapali, about fifteen miles north of Kotá, and two miles and a half from the right bank of the Pranhítá. Here the argillaceous limestone is about eight feet deep; thick-bedded above; more fissile below, and still lower down, passing into white laminated

than Malcolmson, who gave the name of Diamond Sandstone to the iron-banded arenaceous strata of Nágpur and Jabbaipur, which decidedly belong to the Mahádewa series, and were the very rocks of which I was treating in the words animadverted on.—*S.H.*

* Beng. As. Journ. Vol. 1860, p. 356.

strata as at Kotá. The slaty limestone abounds with scales of *Lepidotus*, and the underlying white shale with *Estheria*.

At Sironchá, (Chiraujá) six miles south of Kotá, on the same bank of the Pranhítá, rocks are met with which would seem to be inferior to these. The highest is a coarse sandstone, enclosing pieces of indurated clay, under which lies a very hard fine argillaceous sandstone of various colours, from a dark red to a pale bluish-pink. In the latter my collector, four years ago, discovered compressed stems, which I considered similar to those of Silewádá; and, from the specimens which have since been obligingly sent me by my friends C. R. Glasfurd, Esq., and Dr. Cameron, there can be no doubt of the correctness of the opinion. It is now with me a settled point that the stem-bearing argillaceous sandstone of Sironchá is of Dámúd age, like that at Silewádá.

About ten miles a little north of west from Kota is Krishnapuram, near which commences an outcrop of red clay, which continues westward for twelve miles to Bimeni. Máleli is surrounded by fields of this red clay; but on the south side, at no great distance, is a rise of whitish sandstone, covered with bushes. Near the foot of this elevation, about a mile west of the village, is the site of the *Ceratodus* teeth and coprolites, on which Dr. Oldham has cast so much light;* while a quarter mile south of the village have been found pitted and grooved bony plates, and vertebræ which bear a close resemblance to those of the Dicynodont, discovered by Mr. Blanford in his Panchet group. Along with these there occurred separate rami of remarkable jaws thickly set with 4—6 rows of strong short conical teeth. A singular feature in these jaws is, that there has worked upon them from the opposite jaw a sharp knife-edge, which in most cases has formed a groove along the jaw, cutting off, in a slanting direction, the crown of the teeth that came in its way. In one instance the knife-edge, instead of excavating the usual groove about the middle of the alveolar ridge, has rubbed against the inner row of teeth, and worn them into a flat vertical section. In the same spot a sharp bone was met with, that might have discharged the functions of the cutting instrument, but whether it really did so, or was the mandible of a Dicynodont, I am not competent to determine. Near Bimeni the soil becomes black; but on the west side of Chakinápali, which is three miles west of Bimeni, there is a low hill, at the foot of which red clay is again seen with sandstone above it. With regard to the position of this clay, it is impossible to speak with any certainty; but I think it may be found to underlie the

* Mem. Ind. Geol. Surv., Vol. I., p. 295.

ichthyolitic argillaceous limestone, and perhaps even the stem-bearing argillaceous sandstone.

In a paper read before the London Geological Society in March last, I gave it as my opinion that these strata under the Mahádewa series belonged either to the Upper Trias or Lower Jura,—probably the latter. At that time I had not had an opportunity of becoming acquainted with the marked progress recently made by our Indian Geological Survey, or the elaborate and valuable Memoir of its able Superintendent on the rock-systems of Central India and Bengal.* These advantages having since been enjoyed, I will here briefly state my present view regarding the age of the strata under consideration.

The members of the Survey, with an accuracy to which only they can attain, have pointed out various breaks in the sequence of the rocks which have fallen under their observation. To these intervals, however, may be assigned greater lapses of time than the facts warrant. For example : among the rocks that have been so admirably worked out by Mr. W. T. Blanford,† the Panchet group is shown to rest unconformably on the Dámúdá group ; and yet the genus *Glossopteris*, occurs in the Lower Panchets as well as in the Lower Dámúdás. Again, the Lower Panchets, as Mr. Blanford remarks, appear to be the equivalents of our Mángali argillaceous sandstone, for the Panchet *Estheria* is evidently the smaller form of the Mángali one, or, as I would prefer expressing it, the smaller of our two Mángali species. Now the Mángali strata, in common with the Kámpti boulders, afford those paper-kite-like fossils which Dr. Oldham considers the detached scales of cycadaceous cones, and which he says are to be met with both in the Rájmahal beds, and those designated Upper Dámúdá by Mr. Medlicott. But what seems to me to carry the greatest weight of all is this, that in the Kámpti boulders species of *Glossopteris*, which are identified by Sir C. Bunbury with others in the admitted Lower Dámúdá of Silewádá, are embedded along with a species of *Tæniopteris*, which, as far as I can judge, differs very little, if at all, from *T. lata* (Morris) from Rájmahal. In my opinion, therefore, a shorter period elapsed between the deposit of the Lower Dámúdá and the Rájmahal strata than some may suppose.

On this point I possess little or no stratigraphical evidence. But perhaps the following statement of Mr. Wall's may have some bearing on it. Speaking of certain mottled clays in the Godavery, below Ma-

* Mem. Ind. Geol. Surv., Vol. II., p. 299.

† Beng. As. Journ., p. 352, Vol. 1860. Mem. Ind. Geol. Surv. Vol. III. pt. 1.

hadeopur, he says that they occur again at Sironchá, where they "are the immediate underliers of the limestone."* Now the limestone is most probably of Liassic age; and, as the mottled clays of Sironchá, which I have shown to belong to the Dámúdá group, are stated to be its immediate underliers, it is not likely that these are older than the Upper Trias, unless there is a very great hiatus between the limestone and them. The same conclusion is suggested by the relation of the Panchet and Dámúdá groups at Rániganj itself. If the Panchet and Kotá *Estheria* are to be looked on as nearly allied, or if the abundance of this genus of *Entomostraca* is to be received in India as indicative of a particular geological horizon, then the Lower Panchets must be reckoned as nearly contemporaneous with the Kotá limestone; in other words, somewhere about the age of the Lias; and if so, the underlying Dámúdá group of Bengal is probably about the age of the Upper Trias.

The position of the Máleḍi red clay is at present undetermined; but the borings of Dr. Bell and Mr. Wall would seem to favour the presumption that it is inferior to both the argillaceous limestone and mottled clays of the Pranhitá, which well agrees with the Triassic *facies* of its fossils.

Nothing has yet been done to illustrate the numerous tracks on the Korhádi shale. But I would here desire to recall a statement made by me at a meeting of the Bombay Asiatic Society in November 1858, to the effect that it was probably of marine origin.† The probability lies rather on the side of its deposition in freshwater. From its occurrence at Korhádi in a very disturbed area, it is difficult to compare it with other strata; but from the character of its tracks, and the metamorphic boulders believed to be embedded among its laminæ of fine clay, the authors of the Report on the Tálchír Coal-field appear to be correct in referring it to their Tálchír group.‡

Nagpur, 24th October 1861.

* Madras Journ. Lit. and Sc. 1857.

† See "Appendix," p. lx.—*Ed.*

‡ Mem. Ind. Geol. Surv., Vol. I., p. 76.

NOTE.—All the bones found at Náráyanpur and sent to the Bombay Asiatic Society are infiltrated with siliceous matter, chiefly in the form of agate and chalcedony; this fills the cancellated cavities; while the intervening portions or bony structure, which still presents the lacunæ or bone-cells, and their filamentous expansions or canaliculi together with the Haversian canals into which the latter open, remains calcareous and of a brown or white colour.

There are in all, eight of these bones, of which three only have a determinable form; two are the ends of long-bones with their epiphyses or ends dropt off; and the rest are mere fragments of the cancellated structure of large-bones.

All the determinable forms belong to the vertebral column and consist of:—

1st.—The transverse processes (with their tips broken off) enclosing the hole for the vertebral artery, the condyloid cavity and part of the body,—of an *atlas* of some large animal apparently closely allied to, if not an Elephant. The portion is eight inches long from the top of one of the transverse processes to the end of the body, and the condyloid cavity exceeds four inches in its longest diameter. The latter is of the same diameter as that of an atlas belonging to a skeleton of a large specimen of recent Asiatic Elephant in the Grant Medical College Museum, and the extreme length of the fossil bone, if doubled, would exceed the transverse diameter of this atlas; but the hole in the transverse processes for the vertebral artery, the condyloid cavity, and the body being all in one line, (that is, a straight line drawn from the middle of the former to the middle of the latter, would pass through the middle of the long diameter of the condyloid cavity), makes this bone different from any of the atlases of Elephants figured in the "*Fauna Antiqua Sivalensis*," and different from that of the existing Asiatic Elephant. The second hole or part, of the course for the vertebral artery, is not present. On account of the silicious nature of the infiltration, I cannot make a good section for microscopic examination.

2nd.—The body and a small portion of the transverse processes of, a *vertebra* slightly convexo-concave; expanded laterally, so as to be very nearly as broad as its length, which, from the centre of the concave, to the centre of the convex end is $3\frac{1}{2}$ inches; vertical diameter of concavity and convexity the same, viz. 2 inches, respectively, and breadth in the centre $2\frac{1}{2}$ inches; vertebral canal $1\frac{1}{2}$ inch wide. Transverse processes arising from the greater part of the dorsal aspect of the body on a level with the vertebral canal, and extending nearer to the convex, than to the concave end; presenting at their base, at each end, a concave facet in the body of the vertebra apparently for the articulation of a rib.—This vertebra from the depressions for the ribs, its general dimensions, and the microscopical examination, probably belonged to a mammal larger than a Camel, for it is a little longer and much broader than any dorsal vertebra of this animal, and, of course, larger than any of a Horse, Ox, &c.

3rd.—The body and a small portion of the transverse processes of a *vertebra* strongly convexo-concave; compressed laterally; grooved ventrally. Length from the centre of the concave, to the centre of the convex end $3\frac{1}{2}$ inches; breadth transversely, in the centre $1\frac{1}{2}$ inch; vertical diameter of concavity $2\frac{1}{2}$ inches, breadth in the centre $1\frac{7}{8}$ inches; vertical diameter of the convexity 2 inches, which is less than that of the concavity; the deficiency being ventral where it appears to have been worn upon, (by another bone?) Vertebral canal $\frac{7}{8}$ inch wide opposite the middle of the transverse processes, which are confined almost entirely to the concave half of the body, and arise from its dorsal aspect, on a level with the vertebral canal.—This vertebra probably belonged to a reptile, on account of its strong convexo-concave body which could only be confounded with a cervical vertebra of a mammal; from which again it is distinguished by the absence of the transverse processes in the body of the bone, and therefore the want of the canal for the vertebral artery; while the deficiency in the convexity ventrally, appears to have been for the attachment of the inferior spinous process, which would thus make it a caudal bone. It is a fac-simile of a sketch of a vertebra found at Phisdúra, which Mr. Hislop has sent me for comparison, only that his is $\frac{2}{3}$ of an inch longer. I cannot depend upon the microscopic test here, but the structure tends to a reptilian form; nor is this test worth much generally, so far as my observation

extends. There is too little difference between the bone-cells of Mammals and Reptiles to enable one to pronounce immediately, which is which; and therefore, the microscopic test becomes of very little practical value.

The Museum of the Bombay Asiatic Society contains very few other recognisable fossil bones of Crocodiles, and these are almost all from Perim Island opposite the mouth of the Nurbudda river. They consist of imperfect vertebræ, and the anterior ends of lower-jaws, all of which belonged to animals of moderate size. But there is one portion, viz. the anterior part of the upper-jaw of a Crocodile which came from the Bone-bed of Sind, and was presented to the Society by Sir Bartle Frere,—of very large dimensions.

This fragment, which presents an expanded snout, measures 14 inches from the anterior extremity backwards along the mesial line, and has nine teeth divided by two large notches, one anteriorly and the other posteriorly, on each side of the jaw.

It is the same breadth opposite the canines or most expanded portion as at the posterior part, viz. $8\frac{1}{2}$ inches. The transverse palatal suture is $10\frac{1}{2}$ inches on the mesial line, from the anterior extremity, but extends forward from this to the posterior notch between the teeth on each side, where it is only $7\frac{1}{2}$ inches from the middle of the anterior extremity, of the jaw; and the nasal aperture, which is ovate constricted, is 6 inches long by $3\frac{1}{2}$ broad in its widest portion.

Following the dental margin of the jaw, we find in front, two great teeth, each $1\frac{1}{2}$ inch in diameter, at the alveolar socket, situated close together; then a large notch on each side with conical depressions for three (four including the notch itself) teeth, which belonged to the lower jaw. After this, on the right side, come two large teeth, the first $1\frac{1}{2}$ and the second or canine tooth, $1\frac{1}{2}$ inch in diameter. Then the posterior notch, out of the sides of which respectively project two teeth each $1\frac{1}{2}$ inch in diameter. After this, in a straight line, four other teeth, respectively $\frac{1}{2}$, $1\frac{1}{2}$, $1\frac{1}{2}$ and $1\frac{1}{2}$ inch in diameter. Judging from the general appearance of this fragment, one would say that, in form, the jaw was between that of the thick-nosed Crocodile and thin-nosed Gavial, more nearly allied to the latter than the former; at any rate it belonged to a very large species which perhaps, might have afforded the vertebræ both of Phisidura and Nárráyanpúr.—H.I.C.

ART. XIII.—*On the Sanscrit Poet, Kálidása.* By BHĀ'U
DA'JI', Esq.

Concluded from p. 30.

SUBHAGA' became a widow in her childhood, but according to the chronicles of Gujarat* conceived afterwards by the Sun and gave birth to twins. The male child became renowned as S'ilāditya. He destroyed the king of Valabhi and became the lord of Suráshtra ; but was himself slain in the sack of Valabhi in A.D. 319 by the Mlechas or Sacas.† This is the date of the commencement of the Valabhi Samvat, first made out by Col. Tod from an inscription.‡

In our opinion, it is also the commencement of the Gupta Kála or the Gupta Era, although apparently, weighty arguments have been adduced to show that this era commenced with the overthrow of the Gupta Dynasty. The dynasty has been brought to light by the translation of the inscription on the Allahabad column by Dr. Mill, subsequently revised by Mr. Prinsep, also by the numismatic researches of Prinsep, Lassen, Thomas, and Cunningham. The inscription§ facing the north, on the stone near Junágada which was copied in 1842, by General LeGrand Jacob and N. L. Westergaard, contains allusions to Skandagupta ; and the date one hundred and thirty-seven of the Gupta Era, when Parnadatta constructed a bridge over the Palásiní.

* " Rús-Málá or Hindoo Annals of the Province of Goozerat in Western India." By Alexander Kinloch Forbes, Vol. I., p. 13 *et seq.*—Mr. Forbes' work is a most valuable contribution to the Annals of Gujarat.

† They are called " Sacas " by Merutunga and Rája S'ekkhara.

‡ Tod's " Annals of Rajasthan." Vol. I., p. 801.

§ This copy is published in the Journal of the Bombay Branch of the Royal Asiatic Society for April 1842. We hope soon to be able to give a translation of the inscription. " Up to this time no more satisfactory account of its purport and contents can be given than is to be found in the brief notice published by Prinsep in April 1838."—(Prinsep's Indian Antiquities, by Thomas, 1858, Vol. I. p. 247). We may here add that, in our opinion, the Kuhaon pillar-inscription is dated in the 141st year of the Gupta Dynasty, in the reign of Skanda-Gupta, and not after his decease, as deciphered by Prinsep. (*Ibid.* p. 250.)

The second S'iláditya was of the Yadu family. He ruled over Suráshtra at the commencement of the fifth century and has already been noticed (pp. 29 and 30 *ante*). He presided over 18 Rájás at Valabhi, which was therefore then in existence.

The third S'iláditya is the one noticed by Col. Tod, as having been killed at the sack of Valabhi by barbarians in A.D. 524.* Some important change appears undoubtedly to have occurred about this time in the government of Valabhi, as the date appears to correspond with the establishment of the dynasty of the kings commencing with Bhat-táraka Senápati, brought to light in Mr. Wathen's Valabhi *copper-plate grants*†; their dates 365 and 380 being from the Valabhi, and not from the Vikramáditya Samvat, as hitherto supposed.

There are four S'iládityas noticed in these "*Grants*" as belonging to the dynasty. Harshavardhana of Canoge, the patron of Bána and Hiouen-Thsang, and the subject of a biography by both with extraordinary coincidence of facts, had, it appears, the title of "S'iláditya" ‡ and the Chinese pilgrim, also gives the title to a king of Malwa, who ruled about 60 years before this period. The "Rája Taranginí" applies the title to the son and successor of Harsha-Vikramaditya of Ujjayiní. This exhausts the list of "S'iládityas" known to us at present.

To return to the "Rája Taranginí," we subjoin a translation of that portion of the 3rd Book which is calculated to throw light on the sub-

* Tod's "Annals of Rajasthan." Vol. I. p. 217.—In the numerous Jain works in our possession, we have not met with any account of the destruction of Valabhi in A. D. 524, and as Col. Tod's account of the catastrophe is very similar to what is related to have occurred in A.D. 310, it is probable that two different dates have been assigned to the same event.

† Journal Bengal Asiatic Society, Vol. IV. p. 477.—Prinsep's Indian Antiquities, by Thomas, Vol. I. p. 252 *et seq.* The King of Valabhi who was cotemporary with Hiouen-Thsang (about A. D. 644) is styled "Dhruvapattah?" He was, according to the Chinese pilgrim, a son-in-law of the son of Harshvardhana or S'iláditya.—Hiouen-Thsang speaks of the kingdom of Valabhi, but gives no description of the city beyond its extent. He visited Anandapura, the modern Wadnagara according to the learned author of the Rás-Mála. This Dhruvapattah is to be identified with Mahárájá Dharapattah of the *copper-plate grants*.

The "Kalpa-Sutra" of the Svetámbara Jains is said to have been publicly read at Anandapura in the reign of Dhruvasena, the son of Vira Sena, in A. D. 466. If he be one of the kings noticed in the *copper-plate grants*, the event is ante-dated by about a century. (See the "Kalpa-Sutra" and "Nava-Tatva," translated by the Rev. J. Stevenson, D.D., London, 1848, p. 96.)

‡ "Histoire de la vie de Hiouen-Thsang traduite du Chinois par Stanislas Julien, Paris 1853, p. 220 *et seq.* Also "Mémoires sur les Contreës Occidentales," par M. Stanislas Julien, Paris, 1858.

ject under consideration. In the words of Kalhana Pandit, "The history of the three kings Vicramáditya, Mátrigupta and Pravarasena, who resembling each other in their dispositions for virtue, [and therefore having] honored each other, resembles the water of Gangá, which flows in three channels." ("Rája Taranginí," verse 323, Book 3rd.)*

Translation of the "Rája Taranginí." Book iii.

102.† Hiranya and Toramána his [Shreshtasena's], two sons and successors destined to govern together the kingdom as King and Minister, were the delight of the world.

103. Toramána, having suppressed the multitude of small coins [or coins struck by Bála] that were current, put in circulation "dinars" struck in his own name.

104. The elder of the Kings, said to himself, "How he despises me, and acts as if he were the sole sovereign," and in anger, he caused him [Toramána] to be thrown into prison.

105. Anjaná, the daughter of Vajrendra, of the family of Ikshváku, the spouse of the captive, whose long imprisonment made her forget her grief, became pregnant.

106. She was informed by her husband that her delivery was near. Having entered not without shame, into the house of a potter, she was delivered of a son.

107. This child of the King was brought up with care by the wife of the potter as if he had been her own son, just as a young cuckoo is nourished by a female crow.

* Professor Wilson observes (*Asiatic Researches*, Vol. XV., p. 1.) "The only Sanskrit composition yet discovered to which the title of "History," can with any propriety be applied, is the Rája Taranginí, a History of Cashmir." * * *

"It is a series of compositions written by different authors and at different periods." The portion translated by us is by "Kalhana Pandit," who wrote about A.D. 1148. We have consulted the Calcutta ed. A.D. 1835; the Sanskrit text, and also the French translation by Mons. Troyer.

Wherever we have given a different translation from the learned French Sanskrit scholar, we have done so intentionally, and with the sanction of the best Pandits on this side of India. The following remarks of Mr. E. Thomas, on the period of Kashmirian history under review, are, we think, perfectly correct:—"Major Cunningham's ratiocinations towards the general settlement of the relative epochs, is based primarily upon the assumed fact of Hiranya and Toramána having been contemporaries of the 3rd Vikramáditya of Ujain (S. 466—A.D. 409), whom the author, in preparatory training for the more complete development of the same idea in his subsequent works, identified with the Chandra Gupta of the Gupta-Coin Series, and the 3rd Vikramáditya. I do not at all wish to contest that, there may have been one of the many monarchs who assumed the supplementary titular designation of 'Vikramáditya' ruling over Malwa at, or about this period, and that, the potentate in question, may well have been a contemporary of Toramán of a Kashmir, whom, judging from the style of writing on his coins, I should not desire to place so early as Wilson and Troyer have done."—(*Prinsep's Indian Antiquities*, by Thomas, Vol. II., p. 242.)

† The "numbers" refer to the Slokas in Troyer's addition.

108. Thus he was known to his mother and to the potter's wife, his guardian, as a hidden treasure is known to [our mother] earth and to the guarding serpent.

109. The King's son being, according to the declaration of his mother, grand-son of Pravarasena, was named by the potter's wife after his grand-father.

110. The child while growing refused to mix with his [low] neighbours : as the Lotus, delighting in the friendship of the sun, avoids the contact of the waters.

111. The people saw him with astonishment in the games, when associated with young people of noble family and with those who were endowed with valor and with knowledge.

112. Distinguished by his company for very great vigour, he was created 'king' by the young men, as the young lion is acknowledged superior by other young wild beasts that prowl in the forests.

113. He skilfully managed, treated kindly or subjugated the young people, and never behaved in a manner unbecoming a *rājā*.

114. Having received a mass of loam, placed before him by the potters to make pitchers and other similar things, he formed of them a series of Siva-lingas.

115. Admirable in his conduct,—as he was one day playing, he was noticed by Jayendra, his (maternal) uncle, who made him happy by the attention bestowed upon him.

116. Jayendra having been introduced by the children to him, the young man received him [his uncle] as a king, [viz.] regarded him with haughtiness.

117. Jayendra seeing so many proofs of vigour, concluded that he was not descended from a vulgar family, and on account of his resemblance to the husband of his sister, suspected him to be her son.

118. With a desire to discover the truth without delay, he followed him, and on arriving in the house, he saw his sister with painful surprise.

119. The brother and sister contemplated each other long with sadness, and allowed their warm tears, interrupted by sighs, to flow freely.

120. The supposed son of the potter's wife asked : "Mother, who are these two persons ?" She replied : " My child, this is thy mother, and that, thy (maternal) uncle."

121. Jayendra, after having instructed the young man, who was indignant at the imprisonment of his father, that he must with patience wait for a favorable opportunity, departed to accomplish his design.

122. Whilst Jayendra was preparing himself for the work of vengeance, Toramāna, a son amongst men, died.

123. Then Pravarasena, dissuaded his mother from devoting herself to death ; but being afflicted, and therefore impelled by desire for pilgrimage to the holy places, proceeded to distant regions.

124. Hiranya also, after having governed the country during thirty-one years less ten months, died without leaving posterity.

125. At the same time, the S'rímāna Vikramāditya, otherwise called Harsha, ruled in Ujjayini, as Emperor of all India.

126. The goddess S'rī served this king, who was blessed with unusual happiness, by attaching herself to him with pleasure, having, for him, abandoned the arms of Hari and the four Oceans.

127. Making use of wealth, as a means [of usefulness], he made the virtues flourish ; and thus, till this day, men of talent sit with their heads high in the midst of rich people.

128. Having first destroyed the Sakas, he made easy the burden of the work to Hari, who was to descend to the earth to exterminate the Mlechas.

129. The Kavi, named Mátrigupta, went to see the lord of the world whose fame had extended to distant countries, and who was then seated in the midst of an assembly of accomplished men, to whom he was always accessible.

130. The poet, who had accumulated wisdom in different situations, having thought of the marvellous greatness of the king's good qualities and depth of understanding, abandoned himself to the following reflections :—

131. "This protector of the world, so fond of men of talent, was found by me through my good acts. The history of former kings only brings out the greater excellence of this monarch.

132. "During his reign the servants who know the shástras perfectly, and who are versed in the Vedas, are never deprived of the manifestation of respect due to rank and quality.

133. "The councillor, making with spirit an exposition of his project before him, never experiences the inutility of his skill, as the entreaties of a woman of family, are never neglected by her lord.

134. "As he stops the discourses of the malicious, and distinguishes that which is convenient from that which is not,—true merit in serving him never loses its reward.

135. "Before him, men of talent never feel themselves mortified by seeing well-instructed men placed on the same level with ignorant ones.

136. "The distribution of favors fixed according to a just standard by some one who knows how to judge us, is never envied by generous souls with frequent sighs.

137. "This King, who discovers the hearts of men, receiving with just honors the talent peculiar to each, encourages the efforts of all those who surround him.

138. "The fatigue produced by the skilful zeal of the servants serving the master who takes notice of their pains, is never considered as the sale of ice on Mount Himavat [fruitless].

139. "The man who has a false reputation for merit, never enjoys the confidence of this King ; a quarreller is never his councillor ; a violator of his promises never occupies a place at the court of this monarch.

140. "His domestic servants never make use of improper language, they neither attack each other with bad pleasantries, nor with discourses that wound the heart, neither are they jealous of the approach of others, nor are they conspirators.

141. "This King never sees the faces of people who seek their own interests only, who boast of their own knowledge, and who are blinded by the pride of universal knowledge.

142. "A conversation with the monarch leads to increasing prosperity, which suffers no interruption from persons of low birth and bad morals.

143. "If, by my merits I am introduced to the King, who is free from all vice, and is worthy of veneration, then the fulfilment of my wishes is not distant.

144. "Endowed with profound intelligence, a discernor of merit, and of a firm disposition, this King appears to be worthy of being served, by me who feel freed from all fears of difficulties.

145. "Yes, wandering upon this earth, I do not see any other master so worthy of respect as he,—who is not like other kings, that delight in depriving people of their wealth."

146. Having made these sound reflections, how should not he have desired this so-to-say, new society. How would he not have joined himself to the society of the learned by going amongst them!

147. The King observed the intrinsic capacity of the man who sought to be employed, and who showed his qualities slowly.

148. He reflected thus :—"This man of great mind might well be more than an ordinary man of talent, and his merit deserving of reward."

149. Having so reflected, the Rájá, in order also to test his character by submitting it to trial, did none of those honours to him which are usually paid on receptions.

150. The sage, in spite of this want of favor, knowing that the King was of a benevolent disposition and entertained very liberal sentiments, served him very contentedly.

151. The zeal of the sage which increased from day to day, was taken no more notice of by the King than if it had come from a part of his own attendants.

152. Nevertheless, by a perseverance which never exceeded the just measure, as an autumnal night neither too long nor too short pleases the moon, the King was propitiated by him.

153. Mátrigupta did not allow himself to be disconcerted either by the jokes of the slaves of the house, or the changing stratagems of the chamberlains, or by the mendacious praises of infamous debauchees.

154. When the King spoke to him kindly he remained firm as *chháyá-graha*; (*i. e.* did not become elated), neither did he become irritated when neglected by his master.

155. Being a man of discernment, he never turned his head towards the King's slave-women, nor associated with people lying under the displeasure of the King; and whilst with the Rájá, never held conversation with menials.

156. He never incurred the displeasure of the King, which might have been excited against him by the people of the court, by habitual backbiters around the King, or by those who lived upon espionage.

157. He did not suffer himself to be seduced into relaxation of zeal by those who were opposed to a zealous performance of duty, and who daily repeated that from perseverance in the King's service no recompense was to be hoped for, and other similar sentiments.

158. He took every opportunity of proclaiming the merits of others and by modestly exhibiting his own learning, gained the hearts of honest men.

159. Thus, in serving the King with the greatest zeal and without discouragement, Mátrigupta spent six seasons (one year).

160. As the Rájá was going out one day, and saw this man, emaciated, grey haired, and dressed in old clothes, he began to reflect within himself thus :—

161. "This stranger full of merit, without protection, without friends and relatives, has been subjected to much suffering on my account, who desired to test his firmness.

162. "Who is his protector? Who feeds, who clothes him? Alas! all this has never been considered by me, who am overcome by his superiority.

163. "He, a human tree, becoming attenuated by cold, by wind and by the heat of the sun, has hitherto not been visited by me with one single ray of vernal light.

164. "Who offers him relief when he is sick, refreshment when he is fatigued,

consolation when he is in despair ? Who offers him anything, when he is in want of everything ?

165. "I cannot give him the jewel of desire, nor the nectar of immortality." Oh, that this man, who has so faithfully served me, should have been put to so rude a trial on my account, without reason !

166. "By what manifestation of favour shall I discharge my debt to him who is full of merit, and whom I have so reduced by such severe treatment ?"

167. After the king had made these reflections, no opportunity offered itself to him for a long time of rewarding this servant in a manner commensurate with his own good wishes towards him.

168. Then came on winter, when the whole body is frozen, as it were, by cold winds and falling snow.

169. The regions subjected to such severe cold and under continual darkness appeared as if covered by a blue veil.

170. As the sun, this jewel of heaven, tormented by the cold, and desirous of enjoying the sub-marine fire, hastened, so to speak, to rejoin the ocean, the days decreased in length.

171. One day, the King fortunately awoke at midnight, in his palace which was lit by the light of lamps and blazing furnaces.

172. He saw before him the lamps much agitated by the winds of winter, which, rude and noisy, had made their way through the small holes in the house and had extinguished them.

173. Desiring to relight the lamps, he called to the servants who watched through the night outside, saying, "Who is there ?"

174. And while they were all dead asleep, a voice replied from thence, "Rája, he who is before thee, Mátrigupta, here am I."

175. "Enter," said the King, and this order having been given by the Rája himself, he entered without being challenged into the palace, rendered delightful by the presence of Lakshmi, the goddess of prosperity.

176. "Light the lamps !" continued the King, which having been done by cautious steps, Mátrigupta began to retire, when the King added :—"Wait a moment."

177. Mátrigupta, doubly suffering from fright and cold, and distracted by the thought of not knowing what the King might be about to say to him, sat down trembling at a short distance from his majesty.

178. Then the King asked : "How much of the night has waned !" He replied : "Virtuous lord, only one watch of the night remains."

179. Then the Monarch continued, "How knowest thou so well the time of the night ? Hast thou had no sleep this night ?"

180. Mátrigupta in a moment, composed the following sloka, and reciting it to the King, informed his majesty of his case, being ready to abandon at once hope or misery :—

181. "Where is the sleep of a man who is tormented by cold ; who is plunged during one whole, unhappy month into an ocean of grief ; who blows with blistered tips the smouldering fire ; whose throat is contracted with hunger ? My sleep has gone far from me, like an ill-treated, repudiated wife, and my night is not shortened after the manner that the land granted to a good person never deteriorates."

182. The King having heard this sloka, and having consoled, by kind words, the great poet who was thus burthened with sadness, sent him back to his former place.

183. And then reflected thus :—" Shame upon me, who having heard the discourse of this man, full of burning grief and suffering with all his merits, have nevertheless left him in the same state."

184. " Believing that my kind words are useless like those of other men and not knowing my heart, no doubt he has again sat down outside overwhelmed with grief."

185. " Although I have been most anxiously considering for a long time what precious and worthy favor I could confer upon him, yet nothing has occurred to me up to this moment."

186. " His skilful speech however, calls to my memory, that at present, the desirable kingdom of Kas'mira is without a ruler."

187. " Let me then give that country to this worthy man, and let me put aside other princes for this purpose, although they be powerful and rich."

188. Having taken this firm resolution, the King secretly sent messengers that very night to the Council of Kas'mira.

189. And the following order, viz :—" Let the person named Mátrigupta, as soon as possible after he shows you this order, be installed king of Kas'mira."

190. The King having got his order written and completed the business, and the messengers having departed, retired for the remainder of the night.

191. Mátrigupta, believing his conversation with the King had been useless, gave up all hope and thus even, felt as if relieved of a burden.

192. He also thought within himself thus :—" What was to be done, is done ; my uncertainty is at an end to-day ; abandoning the demon of hope, I shall now walk without care."

193. " How I erred in attaching myself to the service of another ! what have I learnt by following the discourse of the people but servitude ?

194. " The troops of serpents which nourished themselves alone by wind, are called (*bhoyina*) eaters ; the elephants who chase away bees that hum so sweetly are distinguished by the name of (*vistárna karna*) possessors of great [good] ears ; the tree which contains fire in its bosom, is called (*s'amí*) calm : thus, in the loose and useless language of the world, everything is misrepresented."

195. " Nevertheless this King is accessible to everybody, and through him the houses of his friends become dear to Lakshmi, the goddess of prosperity."

196. " What then, is the fault of this liberal Monarch who is so free from all vice ? Rather must my want of virtue be blamed as the obstacle to my fortune."

197. " When the sea dispersing its brilliant waves of pearls is so opposed by the winds, that they are pushed back from the shore, it is certainly the misfortune of the person who seeks a benefit, and not want of liberality on the part of those who would bestow it."

198. " To those who seek benefit quickly, the servants of the king are esteemed great, and not their lords who are not to be propitiated except by severe labour."

199. " Those who maintain themselves at the feet of the lord of beings (*Siva*) do not obtain first anything but the ashes, but those who attach themselves to his Bull, what happy days do they procure for themselves for ever by the acquisition of the brilliant gold !

200. " But by reflection, I see no fault in myself, which having been remarked by this King whom I have served, might have made him conceive aversion for me."

201. " Besides, who is he, who not having been honorably presented by another, could, even with pains, expect to receive favors ?

202. "The ocean changes into precious pearls the drops of water, which first attracted by the clouds, afterwards fall down again from them; receives them, and after they have been seized by the bracelets of the waves, they roll for ever into its bosom. It is thus, that often when introduced with respect by another, a man, although of slight merit, is honored by the King."

203. Having made these reflections, he began to neglect all manifestations of respect. Even the mind of a man of steady principles is led astray when overwhelmed with misery.

204. When the night had passed, and the King at morn sat in the assembly, he said to the chamberlain, "Let Mátrigupta be called!"

205. And after more than one chamberlain had been despatched, Mátrigupta, resembling a man who had become hopeless, entered and approached the King.

206. Having inclined himself several times, the King by a movement of his brow caused a writing to be given to him through his chief Secretaries.

207. Then he spoke to him himself as follows:—"Friend, knowest thou the country of Kas'mira? go there and present this order to the authorities of the country.

208. "Accursed be he by me who reads this writing on the road! Let this be carefully remembered, and let it never be forgotten."

209. Not knowing the intention of the King, and expecting nothing but misery himself, Mátrigupta saw in this order nothing but a burning fire, and not the growing splendor of a jewel.

210. He replied: "Thy order shall be obeyed." Mátrigupta having departed, the King remained without pride, as before, in conversation with his intimates.

211. Then the King was blamed, when Mátrigupta was seen to depart unprovided for the journey; on account of his being feeble, incapable of supporting fatigue, and entirely without friends.

212. It seemed strange, that the King should employ this man who was so respectable, in an affair fit only for the vulgar.

213. This inconsiderate king, considered they, thinks Mátrigupta nothing but a common man, one too, who served him day and night, suffering fatigue without hope. The King thinks him only fit for toil and trouble.

214. It often happens that the servant who takes every opportunity of serving his master is not thought fit for anything better.

215. Desirous of attaining happiness by re-assuring himself against *Garuda*, the formidable enemy of serpents, Sesha left his previous happy state and converted his body into a bed for *Vishnu*, the enemy of the Asuras; but the painful task of carrying the burden of the earth which has no limits, was imposed upon him by this god, who knew his capacity for supporting fatigue.

216. This skilful man, who saw himself superior in talent to the able men who were patronized by the King, served the King with hope.

217. Who is there more discriminate, who has shown more qualities than *this* Mátrigupta? and thus it is that the prince has honored this man of merit.

218. The peacock thinks thus:—"The cloud is pleased by a variety of resplendent forms, although the rainbow, which is the weapon of *Sakra*, is only an unsubstantial one. When he shall have seen my tail with affection, what agreeable favors will it not shower down on me?" He thinks thus, and spreading out the

circle of his tail dances round. But the cloud after all, only presents him with a few drops of water. Who is more heartless than the cloud?

219. No suspicion, however, of his future greatness arose in the mind of Mátrigupta, as he travelled on and without anxiety.

220. But at length aroused to splendid expectations by signs foreboding happiness.

221. He saw in a dream, on the road, a little bird (*Khanjarita*), seated upon the forepart of the crest of a serpent; and then he saw himself raised to the top of a palace and carried across the ocean.

222. Versed in the Shastras, he thought thus:—"On account of these signs which announce happiness, the mission, with which the king has entrusted me, will produce good."

223. "How small soever the advantage may be that I can at first acquire among the people of Kas'míra, will it not in course of time increase, on account of the grandeur of this infinitely rich country?"

224. Thus he travelled on without pain; the hospitable houses and good receptions of the inhabitants favouring him at every step.

225. At last he saw before him Mount Hima reaching to the sky, covered with verdure and waving trees, and white like a beautiful vase of coagulated milk, full of good omen.

226. Winds that bore the perfume of the gum of the *sarala* [cypress] tree, and drops of the Gangá, came to meet him whilst he was approaching these fertile and renowned lands.

227. He reached the place called Kramavarta, and the town of Kámbuva, which yet exists under the name of S'úrapúra.

228. In this place, which was filled with a varied population, he heard, that the great councillors of Kas'míra had become assembled for some business.

229. Then, having thrown off his old vestments, and having dressed himself in white robes, he went to them in order to present the King's letter.

230. As during his walk, omens announcing his fortune had appeared, some travellers followed him in order to see the results of these signs.

231. The porters having been informed that an envoy from Vikramáditya had arrived, announced him quickly to the councillors of Kas'míra.

232. "Let him come, let him enter," was repeated on all sides; and he freely approached the assembled chiefs.

233. Having received him as a prime minister of the King with the usual honors, they made him sit upon a distinguished seat which they assigned to him.

234. After which honors, he was interrogated by the Councillors as to the order of the great King, when he presented the "writing" with much shyness to them.

235. Then bowing themselves to the "writing" of the King, they held a secret meeting, and having opened the "writing" and read it in a low voice, they said respectfully:—

236. "Is thy revered name Mátrigupta?" "Yes," replied Mátrigupta to them with a smile.

237. "Who is here? who is there?" Thus they were heard to say on all sides. Then it was seen that preparations for the installation of a King were arranged.

238. In an instant the place, agitated by a great multitude of people, who made a confused and formidable noise, resembled a troubled sea.

239. Then Mátrigupta was placed upon a magnificent seat of gold facing the east, and being surrounded by the principal authorities, he was installed King with the usual ceremony.

240. Now the water of purification, which [from the golden vase] rushed audibly over his body (the breast of which was firm like a bank of the Vindhya mountains) shone like the torrent of the Revá.

241. Then the people were informed that the King, having had his body bathed, anointed, and loaded with ornaments, had ascended the royal throne.

242. Installed by king Vikramáditya who had been prayed to protect this land himself, they addressed Mátrigupta in these terms:—"Govern us and this country as if we belonged to thee."

243. "Kingdoms are not acquired every day. Despise not, O King, this country for being compelled by others to accept it."

244. As parents are the authors of the immediate birth, which is dependent on one's actions [in a former state of existence], so from a king or from others, proceeds the authority for the administration of a kingdom [*i. e.* Mátrigupta was entitled to it from his previous good career].

245. This being the case, when you say "I am indebted to you," you do injustice to yourself and to us, by thinking less of yourself.

246. Although they had pronounced this true discourse, Mátrigupta, reflecting upon the gratitude he owed to King Vikramáditya, remained for a moment smiling.

247. And celebrating the festival with gifts and liberality worthy of the acquisition of a new kingdom, he terminated the day full of happiness.

248. The next day, invited by the Councillors to make his entrance into the town, he despatched his ambassador with wonderful presents, to him who had given him the kingdom.

249. Feeling that this might suggest a semblance of rivalry with his master on account of the prosperity of the country, he felt ashamed, and thought he was culpable.

250. Then after having called other servants in order to show what he thought of the respect due to a master, he sent him as presents, some eatables, though of little value.

251. Recalling to mind the incomparable virtues of the King, his eyes became filled with tears, and he himself wrote the following sloka and sent it to him privately:—

252. "Thou givest not one sign, thou squanderest no praises; thou dost not even announce thy intention of giving, and nevertheless thou sendest beautiful fruits."

The 113th sloka of the "Megha Duta," which is identical in sentiment with this last verse, has been rendered by Professor Wilson as follows:—

"To thee the thirsty chatacas complain;
Thy only answer is the falling rain;
And still such answer from the good proceeds,
Who grant our wishes, not in words, but deeds."*

* The ("Megha Duta" or "Cloud-Messenger," p. 118.) A'ryá. 10. Sarga 3. of the "Setu-Kávyá," is of the same import.

Regarding Harsha Vikramāditya, Professor H. H. Wilson has made the following observations.—

“Who was this prince? As the enemy of the Sacas, and also from our author’s chronology, he is synchronous with Śālivāhana, with whom indeed, notwithstanding a difference in date of 135 years, all the Hindu accounts represent him to have been engaged in hostility. We have had a Vikramāditya before him in this history, not the Ś’acāri as expressly remarked by the historian, and therefore, we cannot doubt our author’s meaning, although we may question his chronological correctness, as I shall hereafter endeavour to show: it is singular that, in a very long eulogium on this prince, which I have not thought it necessary to translate, the author never alludes to Śālivāhana, nor to any of the literary ornaments usually assigned to Vikrama’s court. This Harsha appears to bear some affinity to Harsha-Megha (A. R. IX. 175) father of Vikrama of the 5th century, in which indeed, he may not very improbably be placed. We must however, leave these points for the present, as we are not yet prepared for their due discussion. The Mahomedan writers are of no assistance here, as they repeat the name of Vikramāditya without any comment on its again occurring.”*

We have here a Vikramāditya several centuries subsequent to his namesake of the Samvat Era, and on whose character, Kālihana Pundit loves to dwell as a patron of poets and as possessed of some of the highest attributes of kings. We have the names of three poets, viz. Mātrigupta, Vetāla-Mentha, and Bhartri-Mentha, who adorned his court, or were at least his contemporaries. The word “Mentha” is no doubt equivalent to “Bhatta,” and it is to be presumed that Vetāla-Mentha and Bhartri-Mentha are identical with Vetāla-Bhatta and Bhartri-Bhatta. Mātrigupta also was, in all likelihood, called Mātrigupta Mentha. In some Jain works, *mentha* is written *mendhra*, which in Sanskrit, according to the “Visva Kosha,” means *great*. The word *mendhra* is, however, so like the Prakrit *mendhā* (sheep) that to this similarity is, no doubt, to be attributed the childish, yet popular tale of Kālidāsa having been born a shepherd, till blessed with poetical genius by Kālī, whom he propitiated by penance according to some, and by accident according to other versions of the story.

Vetāla-Bhatta, we have already noticed, is one of the “nine gems” of Vikrama, and so is Bhartri-Bhatta or Bhartrihari, the author of the Nīti, Vairāgya and Śringāra S’atakas. He is commonly, but errone-

* “Asiatic Researches,” Vol. XV., p. 38.

ously supposed to be a brother of Vikrama; as the fifth couplet* of the *Vairāgya S'ataka* shows, viz. that, the author was an eminent poet, who was dissatisfied with the reception he met with at the courts of several princes, whom he visited in hopes of reward. Bhatti the author of the "*Bhattikāvya*," is popularly believed to have been a son of Bhartrihari; and Bhatti, at the conclusion of his poem, informs us that the work was composed at Valabhī in the age of King S'ridharasena, an assertion tallying with the supposed existence of Bhartri-Bhatta at the time of Harsha Vikramāditya.†

The "*Trikānda Sēsha*," a Sanskrit Vocabulary by Purushotama, gives the following designations of Kālidāsa, viz. *Raghukāra*, *Kālidāsa*, *Medhārudra* and *Kotijit*, but these are evidently appellations indicative of his authorship and talent, rather than of his proper name. Who then is *Mātrigupta*? There is no known Sanskrit work which has a "*Mātrigupta*" for its author, and it is not likely that the poet, who has elicited praises above all others, from the learned author of the "*Rāja Tārangiṇī*," has left no traces of his works.‡

The "*Rāja Tārangiṇī*" does not omit to notice the great Sanskrit poets in their respective historical periods. The date of Bhavabhūti, the learned author of the drama "*Mālati Mādhava*," has been fixed by Professor Wilson at 718 A.D., in the reign of Yas'ovarman of Kanoge, on the authority of the "*Rāja Tārangiṇī*," and later researches confirm the accuracy of the statement. The difference, between the age of the dramatic works of Bhavabhūti and of Kālidāsa, is clearly not of eight centuries. Critical examination of the respective dramas shows that, the interval between them cannot be more than two or three centuries.

We have given all the facts approaching to sober history, which we have as yet been able to meet with, regarding Harsha Vikramāditya,

* उन्मत्तं निषिद्धकृत्या क्षितितलं क्षाता गिरि धातवो निक्षीर्णं स्फुरिताम्पति द्यौप-
तयो यत्नेन सन्तोषिताः। मन्त्राराधनतत्परेण मनसा नीताः प्रसन्नानि निष्ठाः प्राप्ता-
स्मान्वराटकोपि न मया दृष्टो धुना मुञ्च मां॥

Hæberlin's Sanskrit Anthology p. 60. 1847.

† काव्यविदं विदितं मया बलभ्यां श्रीधरसेन नरेन्द्रपालितार्या। कीर्तिरतो भवताः
पुण्यं तस्य क्षेमकरः क्षतिभयतः प्रजाजनानाम्।

‡ We have since met with a commentary on the *Sakuntalā*, by Rāghava Bhata, son of Prithivīdhara, of Vis'wes'varpattana (Benares), in which he quotes *Mātrigupta Chārya*, with reference to the characteristics of dramatic composition. Throughout the commentary (the copy is not complete), we met with 17 slokas, which, from their style appear to be the production of a great poet, and are not unworthy of Kālidāsa. One sloka is quoted second-hand from Bhāmaha, a commentator on the "*Prākṛit Prakāśa*," who again quotes it from the "*Hayagrīva Vudha Nātaka*."

Mátrigupta, and Pravarasena, and now we shall proceed to give reasons for believing that they flourished about the middle of the sixth century of the Christian Era. Professor Wilson, in adjusting the chronology of the "Rāja Tārangiṇī," is induced chiefly by Wilford's theory of a Vikrama in the fifth century, whose father was "Harsha Megha," to place Harsha Vikramāditya about 471 A.D.*

Colonel Cunningham places Toramāna in the sixth century. He observes, "the reign of Toramāna probably extended from A. D. 520 to 550, contemporary with Takta Gupta of Magadha" (Bhilsa Topes, p. 164). He also states that in an inscription from the Fort of Gwalior, "I find Toramāna described as the son of Mátri Dása and the grandson of Mátrikula, who is probably the same as Mátri Vishnu." We think it much to be regretted that the inscription is not yet printed. This king's name was read by Mr. Prinsep as Tārapāni; but from an examination of the inscription, Colonel Cunningham "can state positively that the name is Toramāna."†

It is not unlikely that this Toramāna, noticed in the Eran Pillar and Boar Inscriptions (J.B.A. Society, Vol. VII. p. 632 and 633) is the same as the brother of Hiranya, noticed in the 3rd book of the Rāja Tārangiṇī. Toramāna's coins have been noticed by numismatists, whilst the Rāja Tārangiṇī tells us that his venturing to assume the privilege of royalty by coining money in his own name, was the cause of jealousy between the brothers; and which ended in the imprisonment of Toramāna. We must suppose an intimate connection between the rulers of Kas'míra and the large province included between the Kálindī (Jumna) and the Narmada, a conjecture rendered probable by the fact of the readiness with which the nobles of Kas'míra accepted Mátrigupta for their ruler, at the behest of Harsha Vikramāditya of Ujjayinī. The Mátridása and Mátrikula of the Gwalior Inscriptions, according to Colonel Cunningham and the Mátri Vishnu of the Eran Pillar inscription, belong to a Brahman dynasty of Rájás, although evidently looking upon Toramāna and Buddhagupta as their superiors. Mátrigupta in all likelihood belonged to this family of Maitráyaníya Brahmanas. The Rāja Tārangiṇī tells us that he served Harsha Vikramāditya in different situations. It is not likely that a mere suppliant brahmana and poet would be placed over a province noted for its religious sects and turbulent nobles, unless he had at the same time, some kingly pretensions to ensure fear and respect. Mátri Vishnu is a worshipper

* "Prinsep's Indian Antiquities," by E. Thomas, Esq., Vol. II. p. 244. Asiatic Researches, Vol. XV. p. 38.

† "Bhilsa Topes."

of the Boar Avatára of Vishnu. Mátrigupta in Kas'míra is said in the Rája Táringiní to have established the worship of Madhumathana or Vishnu, under the name of "Mátrigupta Swámí," and this is the only circumstance that creates a shade of doubt in our mind respecting the identity of Mátrigupta with Kálidása, who, in his extant works always invokes Siva, and otherwise, appears to have been a devout Saiva. It is to be presumed that as ruler of Kas'míra, where the Buddhists and Vaishnavas prevailed, he studied to please the prevailing sects by erecting a temple to Vishnu, and by a mandate prohibiting the destruction of living beings.

We have been fortunate in meeting with a few scattered leaves of a poem in Prákrit, called the "Setu-Kávyá,"* with a Sanskrit commentary, in which the poem is described to have been composed by Kálidása at the request of Rája Pravarasena.

In a work on poetry, called Pratápa-rudra," by Vidyánátha, who was patronised by Pratápa-rudra of Telingana about the end of the twelfth century, an A'ryá is quoted from the "Setu-Kávyá," (which is styled a "Mahá-prabandha"). Dandi, who is placed by Professor Wilson at the end of the eleventh century, in the "Kávyádars'a," praises the poem although written in Prákrit, as an "ocean of the jewels of beautiful sentences." The work is alluded to in the Sáhitya Darpana.

An expression in the Varánasi Darpana of Sundara is explained by the commentator Rámásrama to be an allusion to Kálidása, "who wrote the Setu-Kávyá."

Pravarasena, the hero of the Setu-Kávyá, is undoubtedly the king of Kas'míra who succeeded Mátrigupta. We have already given from the Rája Táringiní, an account of the construction of a Naú-setu or bridge of boats by Pravarasena, the Vetastá, the Hydaspes of the Greeks, on which the capital of Kas'míra was then situated. The construction of this very bridge is the subject of the Setu-Kávyá (bridge-poem); and Pravarasena is rightly called by the commentator "Abhinava," that is, new, junior, or second, because we learn from the Rája Táringiní that, his grand-father Sresthasena,† was the first to be styled "Pravarasena." In Prinsep's genealogical tables no other Pravarasenas are to be found.

* From the incompleteness of the MS. which was copied about 130 years ago, it is impossible to make out the name of the Commentator. A complete copy was promised to us from Central India, but our efforts to obtain it have as yet proved fruitless.

† This distinguished monarch, according to the Rája Táringiní, sent a maritime expedition to Ceylon which returned triumphant.

The Sanskrit poet Bána who was a contemporary of Hiouen-Tsang, as they both visited and were patronized by Harshavardhana or Siláditya, the powerful king of Kanoge, praises in the following words the beautiful diction of Kálidása and the glory of Pravarasena, diffused by the Setu-Kávyā :—

कीर्तिः प्रवरसेनस्य प्रयाताकुसुदेज्जला सागरस्यपरंपारंकपिसेनेवसेतुना
निर्गतास्तुनवाकस्यकालिदासस्यसूक्तिषु श्रुतिर्नष्टुराद्रास्तुमंजरीष्विवजायते

Trans. The glory of Pravarasena, bright as the white lotus, extended beyond the ocean by means of the Setu [Kávyā], just as the monkey-army crossed the ocean by the Setu [bridge].

“Who is not enraptured with the sweet and good diction of Kálidása, &c?”*

As Bána notices together Pravarasena and the Setu-Kávyā, we have here confirmation of the correctness of the assertion of our commentator that, the poem was composed at the request of the king. At all events the age of Bána being clearly ascertained, and the authenticity of the couplets quoted above, being undoubted, we have a limit to the modernness of the great Kálidása. The Harsha Charita enables us to fix the age of Bána in the beginning of the seventh century of the Christian Era. This valuable work was first brought to light by Professor Fitz-Edward Hall in 1859. He has given an excellent analysis of it with full notes, in his learned preface to the *Vásavadattá* of Subandhu, forming a part of the “*Bibliotheca Indica*.” Our own copy, (made about sixty years ago,) is apparently similar in almost every respect, to those of the learned Professor.

According to tradition, the poets Bána and Mayúra were contemporaries of Bhoja. Some Jain records make them contemporaries of a Vridha or elder Bhoja; others, such as the author of the “*Bhoja-Pra-bandha*,” bring them down to the age of Munja and Bhoja, in the eleventh century of the Christian era.†

But the Harsha Charita leaves no doubt about the existence of Bána in the beginning of the 7th century. We possess the means of making some

* Harsha Charita of Bána.

† *Copper-plate grants*, which notice Bhojadeva of the 11th century, make no allusion to his liberality, learning, nor to his patronage of learned men.

Babu Rajendralal Mitra has published an Inscription from Thanewar, in the *Journal of the Bengal Asiatic Society* No. VII. of 1853, p. 673, with remarks, wherein the learned Babu thinks the Bhoja of this inscription, lived in Samvat Era 179.—It is to be much regretted that the fac-simile was not printed at the same time. In our opinion, the inscription is not so old.

approximation to the age of Mánatunga Súri from the Jaina Sthirávalis or lists of hierarchs, and we have patiently compared seven of them composed at different times, but all within the last five hundred years. Mánatunga appears by these lists to have lived in the 3rd century, but the result is no doubt incorrect. He was, in our judgment, a contemporary of Bána in the 7th century.

We shall proceed to show that Pravarasena the second, lived in the 6th century of the Christian Era, and that he honoured Hiouen-Thsang both on his arrival in, and at his departure from India. Unfortunately, the Chinese traveller has not given the name of the king, but a brief foot-note regarding the constructor of the Vihara or monastery, where he put up for a night, on his arrival at the capital of Kas'míra, taken in connection with a statement by Kalhana Pundit, in the Rája Tárangiṇi, regarding the construction of this identical Vihara, enables us to fix upon Pravarasena the second, as the king of Kas'míra and contemporary of Hiouen-Thsang.

"When he [Hiouen-Thsang] arrived at the capital [of Kas'míra] he stopped in a convent, called She-ye-in-to-lo-sse (Jayendra Vihára)."*

The Rája Tárangiṇi (3rd book verse 355) has:—"Jayendra the maternal uncle of the king [Pravarasena, son of Toramána and successor of Mátrigupta], raised an edifice known by the name of Vihára of S'ri Jayendra and of the great Buddha."

As shown in verse 105, *idem*, the (maternal) grand-father of Pravarasena II. was Vajjrendra, whose daughter Anjaná, was married to Toramána. Anjaná's brother was named Jayendra, whose daughter would, according to Hindu custom, be the likely spouse of his sister Anjaná's son, Pravarasena. Vajjrendra was descended from Iks'ha-Váku. This confirms the Chinese traveller's note, which, short as it is, now enables us to fix some important chronological data in an interesting period of the history of Kas'míra, i. e. it enables us to recognize Pravarasena II. of Kas'míra, as a contemporary of Hiouen-Thsang.

* * * *

We read in Hiouen-Thsang's narrative (p. 90):—"When the master of the law began to cross the frontiers of this country, he arrived at the *gate of stone* which is the western gate of the kingdom. The king ordered the younger brother of his mother to go to meet him with chariots and horses." This younger brother was in all likelihood Jayendra himself, unless he had a younger brother. Hiouen-Thsang notices

* This Convent had been built by the father-in-law of the King. (Note of the Chinese author.)

two other Viháras in the capital, viz. the Vihára called Hu-se-kia-lo (Huskara ?) where he spent a night in the house of happiness "Punya Sálá,"—"to which the King betook himself, at the head of all his officers and monks of the capital, and went to meet Hiouen-Thsang with a suite of more than a thousand persons. The road was covered with umbrellas and standards, and the whole way was inundated with perfumes and flowers. When he was in the presence of Hiouen-Thsang, he overwhelmed him with praises and marks of respect, and scattered, with his own hands, an immense quantity of flowers in his honour. Then he requested him to mount on a great elephant and followed in his rear.

"When he had arrived at the capital, he stopped in a convent called She-ye-in-to-lo-sse (Jayendra Vihára).

"The next day (the King) asked him to enter his palace to receive homage and to sit at his table. At the same time he commanded several half scores of monks of eminent virtue, to take food in that banquet. When the repast was over, the King invited the master of the law to open conferences on the different points of the doctrine."

This house of happiness first ingeniously rendered by the learned Stanislas Julien "dharmas'álá," and afterwards corrected to "Punya-s'álá," is undoubtedly the Amrita buhvana (house of Amrita or Ambrosia), noticed by the Rája Tárangini, as a lofty building constructed by Amrita-prabhá, the favourite queen of Megha Váhana, who was the great-grandmother of Pravarasena II. for the use of the mendicants (bhikshukas) from foreign countries.

Such facts leave no doubt in our mind that the King of Kas'míra was "Pravarasena II." He was living when Hiouen-Thsang set out on his journey back to China. "The king of Kas'míra (Kea-shi-melo) having heard that the master of the law was approaching in light-marches, forgot the fatigues of a long journey, and came personally to visit him, and to offer him his homage; he only returned after several days." Pravarasena was then evidently very old, and hence the allusion to the fatigues of a long journey; thus we may now well believe that he reigned sixty years, as stated by the Rája Tárangini. Hiouen-Thsang thus speaks of Malwa (p. 204):—

"The inhabitants (of Malwa) are of a meek and polished character; they love and esteem the culture of literature. In the five parts of India, Malapo (Malwa) to the south-west and Mokeeto, (Magadha) to the northwest, are the only two kingdoms in which the inhabitants

distinguish themselves by their love for study, their esteem for virtue, by the facility of their pronunciation, and by their harmony of language."

* * * *

"According to tradition, the throne was occupied sixty years ago by a king of the name of Kiajee (Siladitya) [Vicramaditya ?] He was endowed with great talents, and possessed of great knowledge. He was full of respect for the *three precious ones*. From his accession to the throne till the moment of his death, not a single unbecoming word escaped from his mouth, and anger never reddened his face."

* * * *

"During the fifty years' reign he never interrupted his meritorious works for a single moment. The whole nation conceived, on account of this, a lively affection for him, which is not yet extinguished."

This account evidently refers to the age of Kálidása and Vicramáditya. While Siláditya of Malwa, who must not be confounded with his namesake of Kanoge, 60 years later, is either Harsha-Vicramáditya himself or his son, who according to the Rāja Tárangini, was styled "Siláditya" or "Pratápasíla." Vicramáditya is more likely indicated, because the last authority tells us, that Pratápasíla was restored by Pravarasena to the empire of his father, from which he had been driven by his enemies, and from whom Pratápasíla brought back "the marvellous throne" belonging to his family.

Varáha is mentioned in the "memorial-verse" as one of the "nine gems" of Vikrama, and we have now very good means of ascertaining the age of this eminent Hindu Astronomer; the latest and the most judicious writers on Hindu astronomy have placed Varáha Mihira about A. D. 570. (Translation of the "Sūrya-Siddhānta," a Text-book of Hindu Astronomy; with notes and an appendix; by the Rev. Ebenezer Burgess, &c. p. 260; and Journal of the American Oriental Society, Vol. VI. No. II. 1859, Art. III). It is possible that there was an older Varáha Mihira in the 2nd or 3rd century of the Christian Era, as stated in Dr. Hunter's list of Hindu Astronomers which was given to him at Ujjayiní. We have important data to furnish, regarding the age of the various Indian Astronomers as well as of the ancient Hindu Medical-writers, but on account of the length to which this "Paper" has reached, we shall reserve the discussion of this subject for a future occasion.

The time we have assigned to Harsha-Vikramáditya is that which

corresponds with the period, which is given as the initial and principal point of the fixed sphere ; it is also the date assigned to Varāha Mihira and to Jishnu the father of Bramhagupta. We have adduced historic evidence to show the contemporaneous existence of Harsha-Vikramāditya, Mátrigupta, Vetālabhatta, Bhartribhatta, Varāha-Mihira and Jishnu. We have the evidence of the Chinese Buddhist-pilgrim as to the zeal with which the Sanskrit language was cultivated in the seventh century at Malwa, and of the affectionate remembrance in which king Silāditya of Malwa, sixty years before this time, was held by the people of that country. If any time in the history of Ujjayinī could lay any pretensions to be styled, the Augustan Age of Sanskrit literature and science, it was clearly the reign of Harsha-Vikramāditya, when Sanskrit grammar and rhetoric and poetry were cultivated with unexampled success ; when the Hindu astronomical system was elaborated, and the equinox of A. D. 570 chosen as the principal point of the fixed sphere ; and when the "Sūtras" and other writings of the first A'ryabhata were collected into regular "Siddhantas" ; when Varāha-Mihira wrote his celebrated Encyclopædia or "Sanhita" and other astronomical and astrological treatises ; when, in all likelihood, the medical opinions of Sus'ruta and of Charaka were also elaborated into the shape they now bear ; and when the liberal views and Buddhist faith of this illustrious monarch (Harsha-Vikramāditya) patronized foreign literature, and especially that of the Yavanas or Greeks, on which account, it is to be presumed, he was styled "Yavana-Bhoja."

It is worthy of observation that, the neighbouring empire of Persia owned the celebrated Noushīrvān for its ruler, honourably distinguished by the appellation of "the just," and equally celebrated for his learning, liberality, magnanimity, and military exploits. It was Burzuchumīhr, the minister of Noushīrvān, who despatched the physician Barzuya to India for obtaining a copy of the "Panchatantra" or original of the "Hitopadesa," which he got translated into Pehlvi. He also introduced the game of chess from the same source. We have also a great deal to say regarding the "Panchatantra" and its real authors, but for reasons already stated, we shall reserve this also for another opportunity. We shall only here surmise that, the name "Barzuya" is in all likelihood the same as "Vararuchi." Whether this Vararuchi is the same as the one of the "nine gems," we have no means of ascertaining, but when we consider that, he was able to translate the "Panchatantra" rapidly into Pehlvi ; and that he was acquainted with medical and other writings of the Hindoos which, at that time, were chiefly in the Prakrit language, we are led to believe that, the later Vararuchi of Harsha-Vikramāditya's

court was this Barzuya. We write this with the knowledge that, the "Kalila va Dimna," the Arabic translation from the Pehlvi version, informs us that, the "Panchatantra" was obtained at Pataliputra, and that it takes no notice of Ujjayiní. The Buddhist Amarasingha, the lexicographer, flourished more likely in the sixth century after, than in the first century before Christ. Sanku, according to the Rája Táranginí, flourished in the reign of Utpalápira, about the end of the ninth century. In placing Sanku among the "nine literary gems," supposing that no other Sanku is meant, the author of the Jyotirvidábharaṇa is clearly guilty of an anachronism, but we have good reason to believe the contemporaneous existence of Mátrigupta, Vétala-bhatta, Bhartribhatta, Varaha-Mihira, Amarasingha and Vararuchi. The "nine gems" of Vikramáditya's court are those of Harsha-Vikramáditya of the 6th century, and, with every desire to maintain the popular glories of the Samvat Era, we have discovered nothing to place the Augustan Age of Indian literature in the Samvat Era. We are now convinced that, even the popular stories regarding Vikrama belong, as we incidentally noticed, to an homonymous monarch of far more ancient date.

Since this "Paper" was read we have had excellent evidence for placing the Nassik-inscription, noticing the glory of Vikramáditya, in the second century of the Christian Era; and it is clear, that the inscription refers to a much older Vikramáditya than the one after whom the Samvat Era is called.

Bhartribhatta is related, in the Rája Táranginí, to have caused his dramatic production, called Hayagríva-vadha Nátaka, to be represented before Mátrigupta in Kas'míra. The discovery of this drama, which is believed to be extant, though very rare, would throw considerable light on the subject.

In conclusion, we add the following further reasons for believing Mátrigupta to be the same with Kálidása, viz :—

The Goddess Káli or Durgá plays even a more important part in the legendary history of Kas'míra than in that of Ujjayini, and some of the stories now current regarding Kálidása, in connection with the goddess Káli, had, in all likelihood, their origin in the former region, justly styled the region of fiction.

If every Vikrama were ready upon the least disappointment or fit of ill-humour, to lay his own head at the feet of the goddess, Káli, who interposed and granted his boon, the kings of Kas'míra were equally ready to offer their heads for no selfish object, but to save the lives of innocent animals offered in sacrifice to Durga. Pravarasena had a Vetála or protecting genius as well as Harsha-Vikramáditya.

The 181st verse in the 3rd book of the *Rāja Tārangiṇi*, which is said to have been recited by Mātrigupta in communicating his sufferings to Vikrama, is put into the mouth of "a learned poet" at the court of a Bhoja, in the *Prabandha Chintāmani* of Merutungāchārya, a Jain Writer of the 15th century, who relates the story only a shade differently.

The 255th verse of the 3rd book of the *Rāja Tārangiṇi*, (Calcutta Ed. and verse 252 of Troyer's Trans.) therein attributed to Mātrigupta, contains exactly the same ideas, and is repeated nearly in the same words as in the 113th verse of the *Megha Duta* of Kālidāsa (Ed. Wilson).

There is a tradition that Vikramāditya was so pleased with Kālidāsa that he bestowed on the poet half of his territories. In keeping with this tradition, the *Rāja Tārangiṇi* tells us, that Mātrigupta was appointed by Harsha-Vikramaditya, Governor of Kas'mira, during an interregnum, and that he ruled there for four years, nine months, and one day. Vikramāditya died shortly afterwards, and the rightful heir Pravara-sena, who was away from Kas'mira, having appeared in the field, Mātrigupta wisely resigned his post and secured a generous friend in Pravarasena. The *Rāja Tārangiṇi* informs us that the poet became a Yati, retired to Benares and died ten years afterwards.

Mallinātha, in commenting on the 14th verse of the *Megha Duta*, incidentally notices that Dingnāgāchārya and Nichula were contemporaries of Kālidāsa, the former his adversary and the latter a fellow-student and bosom friend. As Dingnāgāchārya's *Gotama-sūtra-vṛtti*, is extant, Professor F. E. Hall, who alludes to the work in his learned notes to the *Vāsavadattā*, may be able to throw some light on the subject.

Kālidāsa, although a resident of Ujjayinī, which he notices in his works with evident predilection, was in all likelihood a native of Kas'mira, or of a conterminous province.

His illustrations are derived chiefly from the Natural History and physical geography of northern India. The "towering summits" of the Himālaya decked with "diadems of snow;" the peak of Kailās "reflected in the waters of the dark Yamuna;" the "rippling Gunga laving the mountain pine" "the musky breezes throwing their balmy odours o'er eternal snow;" the "wilds, where eager hunters roam; tracking the lion to his dreary home;" the "peaks, where "sunshine ever reigns," where "birch-trees wave," the "bleeding pines their odorous gums distil;" and the musk deer spring frequent from their covers; "the magic herbs that pour their streamy light from mossy Caverns, through the darksome night;" the "wild kine" with

"her bushy streaming hair;" the fierce elephant; the startled deer; the lotuses that "lave their beauties in the heavenly Ganga's stream;" the mountain lake; "the clefts from which dark bitumen flowed;" the melting snow; the cool gale; the "rude mantles of the birch-trees rind;" these and other allusions indicate extensive observation, and familiarity with the gorgeous scenery of the Himálaya mountains, with an ardent love of nature. Kálidása is the only great Sanskrit poet who, so far as the writer is aware, describes a living saffron-flower. The plant, we know, grows in Kas'míra and the regions west of it. He never compares any thing to the pomegranate or to the rose, which are frequent subjects of allusion and comparison in almost all modern oriental poetry. The lips of Kálidása's young maidens are of coral-hue, red as the petals of the Nelumbeum or as the ripe Bimba, (*Momordica dioica*), or as the pátala flower (*Bignonia suaveolens*) or as the budding leaves. Their teeth are "white as pearls" or as the Kunda (jasmine). "Their eyes are "bright like wine" "and beautiful as the lotus,—they write their love-letters on the rind of the birch with mineral dyes, or on leaves with their nails. He speaks of "the sentimental compositions of former poets." His language is simple, and his similitudes are copious and unrivalled for their elegance. The vocabulary of Amara Singha is sufficient for explaining almost all the words in Kálidása's works,—whilst to understand the poems of Mágha, a contemporary of the Bhoja of the 11th century, the assistance of a number of vocabularies is required. The metres are more varied, and the grammatical constructions long and difficult. Kálidása's metres and grammatical constructions are plain and generally known; yet the effect is great. He is justly praised for his happy choice of subjects, his complete attainment of his poetical intentions; for the beauty of his representations, the tenderness of his feeling, and the richness of his imagination. He shows an acquaintance with Chinese pottery and silks,—with the magnet;—and in one instance, with the true cause of eclipses, the influence of the moon on the tides, and with ships. His kings are attended by Yavana women (Greek or Bactrian) with bows in their hand. He has minute acquaintance with court-life. The various beasts, birds, trees, flowers, fishes, and insects alluded to by Kálidása, are common to nearly the whole of India, and therefore do not assist in discovering the poet's birth-place, or his favourite places of residence. He had undoubtedly travelled a great deal.

Like many congenial spirits he had also no doubt suffered from the pangs of poverty and neglect. He devoutly prays that "for the common welfare of the good, the mutual rivals Fortune and Eloquence

may at last be wedded in that union which now seems so hard to be attained."

What is the argument of the "Megha Duta" but a faithful picture of his feelings caused by separation from his dear wife and home!—a fact related also of Mátrigupta in the Rája Tárangiṇi. Kálidása, under the disguise of a Yaksha or Demigod, seated on the mountain "Rámagiri" in Central India, addresses one of the heavy clouds gathering in the south, and proceeding in a northerly course towards the Himálaya mountains, "the fictitious position of the residence of the Yakshas." He desires the cloud "to waft his sorrows to a beloved and regretted wife." The places are correctly conceived. A straight line from Oujein to the north, the course assigned to the cloud-messenger, passes through the valley of Kas'míra:

In Kas'míra or its neighbourhood, the writer believes, the birth-place of Kálidása ultimately will be found. The name of his wife was in all likelihood Kamalá. The stories of the Bhoja Prabandha are rejected, as relating to some modern rhymester and libertine of Dhárá, —a name never noticed in any of the great Kálidása's genuine works. It is clear, the simple loves of "Urvas'ī" and "Sákuntalá" could not have found favour at the court of the Bhoja of the 11th century.

Lastly, we would observe, that if the identity of Mátrigupta and Kálidása be established, the exact age of the great Sanskrit Poet, who is now rising into universal celebrity, would be fixed in the middle of the 6th century of the Christian Era; while the fact would be of no less importance to the history of Sanskrit Literature than to the credit of humanity. Inasmuch as the prince of India's Poets would be proved to have been distinguished as much for his fine feeling, and purity of conduct, as for the highest learning and poetical talent.*

* *Correction.*—For the "Translation" of Vira's prophecy given at the bottom of p. 29 *ante*, read instead of what is there inserted:—

"Three years and five months and a half after my nirvána [death] there will be O'Indra the 5th árá; [a chronological period according to an artificial arrangement of the Jains]; and 466 years and 45 days after it, [the 5th árá] Vikramárka Raja honoring the advice of Siddhasena Sárfi as the words of Jina, will free the earth from debt, and, setting aside the current era, will establish his own."

Also for ५५५ : in the Sanskrit, read ५५५ first line.

ART. XIV.—*Index to Original Papers and Compilations by*
H. J. CARTER., Esq., F.R.S.

Presented 14th November 1861.

THIS "Index" is inserted for those who, pursuing the same or similar subjects, may have occasion to refer to it. All the "Papers" but one have been written and illustrated by the Author since he came to India, and nearly all since he was elected Honorary Secretary of the Society in 1847.

Abbreviations.

Journal of the Bombay Branch of the Royal Asiatic Society. J.B.A.S.
Transactions of the Medical and Physical Society of Bombay.
T.B.M.S.

Annals and Magazine of Natural History. "Annals."

Geological Subjects.

- 1844 Observations on the Alluvium of the Indus, and figures of Eocene Fossils about Hydrabad, in Sind.—J.B.A.S. Vol. ii. p. 40. [With one Plate.]
- 1847 Report on Copper-ore and Lithographic Limestone from the South-east Coast of Arabia.—*Idem*, Vol. ii. p. 400.
- 1848. On Foraminifera, their Organization and their Existence in a fossilized state, in Arabia, Sind, Cutch, and Khattiyawar.—*Id.* Vol. iii., pt. 1, p. 158. [With two Plates.]
- 1850. Geology of Muskat.—*Id.* Vol. iii., pt. 2, p. 118.
- 1852. Geology of the South-east Coast of Arabia.—*Id.* Vol. iv. p. 21.—Reprinted, with additions and alterations, in "Geological Papers of Western India, &c." [With a Map.]
- „ Geology of the Island of Bombay.—*Id.* Vol. iv, p. 161. [With a Geological Map and five Plates.] Reprinted, with alterations and additions, in "Geological Papers of Western India."
- 1853. Pleiocene Deposits on the Shores of the Arabian Sea.—*Id.* Vol. iv., p. 445.
- „ Description of some of the larger forms of Foraminifera, in

1853. Sind.—*Id.* Vol. v. p. 124 [with one Plate]; and “Annals,” Vol. ii., p. 161.
- „ Description of *Orbitolites Malabarica*, Auct.—J.B.A.S. Vol. v. p. 142; and “Annals,” Vol. ii., p. 425. [With illustration.]
1854. Canaliferous Structure of *Alveolina elliptica*.—“Annals,” Vol. xiv., p. 99. [With illustration.]
- „ Summary of the Geology of India.—J.B.A.S. Vol. v., p. 179. [With a Map.] Reprinted, with Notes and alterations in “Geological Papers of W. India.”
1858. On Contributions to the Geology of Central and Western India.—J.B.A.S. Vol. v., p. 614.
- „ Geological Papers on Western India, including Cutch, Sind, and the South-east Coast of Arabia, to which is appended a Summary of the Geology of India generally. Compiled and edited for the Government of Bombay.—One Vol. roy. 8vo. pp. 808, with Atlas of 32 Maps and Plates.
1859. Report on Geological Specimens from the Persian Gulf, collected by Lieut. C. G. Constable, I.N.—Beng. A. S. Jour. No. 97, p. 41, New Series.
1861. Concluding part of Report on Geological Specimens from the Persian Gulf, &c., collected by Capt. C. G. Constable, H.M.I.N.—*Idem*, No. 105, p. 359, N.S.
- „ Further Observations on the Structure of Foraminifera and the larger fossilized forms of Sind, including a new Genus and Species.—J.B.A.S. Vol. vi, p. 31; and “Annals,” Vol. p. 309, &c. [With three Plates.]
- „ On Contributions to the Geology of Western India, including Sind and Beloochistan.—*Idem, id.* p. 61.
- „ Notes on the Geology of the Islands around Bombay.—*Id. id.* p. 167.
- „ Description of a portion of pink Granitic Rock (*Pegmatite*) found *in situ* amidst the black Basalt of a Dyke in the Island of Carinja, about seven miles from Bombay.—*Id. id.* p. 178.
- „ On the Section of Trap in the Western Ghats exposed by the cutting for the Bhore-Ghat Incline Railway.—*Id. id.* p. 181.
- „ Note on the Fossil-bones from Nárráyanpur (near Saugor, in Central India), presented to the Society by Capt. W. T. Nicolls, Madras Army.—*Id. id.* p. 204.

Zoological, Botanical, and Physiological Subjects.

1839. Colours of the Tapetum how derived.—*Medical Gazette*, January 1839.
1844. Anatomy of the Musquito (*Culex pipiens*, Linn.), erroneously entitled "Anatomy of the Sind Musquito."—*J.B.A.S.* Vol. 1, p. 430. [With a Plate.]
1847. Notes on Species of Freshwater Sponges (*Spongilla*) in the Tanks of Bombay with observations on their Structure and Animality.—*T.B.M.S.*, Vol. viii., p. 101; and "Annals," Vol. i. p. 303. Second Series.
1849. Descriptive Account of the Freshwater Sponges (*Spongilla*) in the Island of Bombay, with observations on their Structure and Development. *J.B.A.S.*, Vol. iii., part 1, p. 29 [With three Plates]; and "Annals," Vol. iv. p. 81.
- „ On the Red-colouring Matter of the Salt in the Salt-pans of Bombay.—*J.B.A.S.*, Vol. iii. pt. 2, p. 32.
1852. On the Form and Structure of Operculina (*Operculina Arabica*, Auct.).—*Idem*, Vol. iv., p. 430 [With a Plate]; and "Annals," Vol. x., p. 161.
1854. Zoosperms in *Spongilla*.—"Annals," Vol. xiv., p. 334. [With figures.]
1855. Development of Gonidia (?) from the Cell-contents of the Characeæ, with Observations on the Circulatory Motion of the Mucus.—"Annals," Vol. xvi. p. 1.
1856. On the Conjugation of *Cocconeis*, *Cymbella* and *Amphora*, with some remarks on *Amphiphora* (*alata*? Kutz.) "Annals," Vol. xvii. p. 1. [With a Plate.]
- „ Further Observations on the development of Gonidia (?) from the Cell-contents of the Characeæ, and on the Circulation of the Mucus-substance of the Cell. "Annals," Vol. xvii. p. 101. [With two Plates.]
- „ Abstract of "Notes on the Organization" of Infusoria.—"Annals," Vol. xvii. p. 356.
- „ Notes on the Freshwater Infusoria of the Island of Bombay.—No. 1, "Organization."—*J.B.A.S.* Vol. v., p. 429; and "Annals," Vol. xviii. p. 115. [With three Plates.]
1857. On the Development of the Root-cell and its Nucleus in *Chara verticillata*.—*J.B.A.S.* Vol. v., p. 521, and "Annals," Vol. xix., p. 13. [With one Plate.]

1857. Transformation of the Vegetable Protoplasm into *Actinophrys*.—"Annals," Vol. xix. p. 259.
- „ On the Ultimate Structure of *Spongilla*, with further Notes on Infusoria.—J.B.A.S. Vol. v. p. 574; and "Annals" Vol. xx. p. 21. [With one Plate.]
1858. On Specific Character, Abnormal Growth, and Fecundation in *Edogonium*.—"Annals," Vol. i. p. 29. Third Series. [With one Plate.]
- „ Description of a Lacustrine Species of *Flustra* from Nagpore.—"Annals," Vol. 1, p. 169. [With one Plate.]
1855. Note on a Species of *Nostoc* from Sind.—J.B.A.S. Vol. v. p. 689.
1858. On the Red-Colouring Matter of the Sea on the Shores of the Island of Bombay.—"Annals," Vol. i. p. 258.
- „ On the Spermatology of a New Species of *Nais* (*Nais fusca*, Auct.)—"Annals," Vol. ii., p. 20 and 90. [With three Plates].
- „ On Fecundation in *Eudorina elegans* and *Cryptoglena*.—"Annals," Vol. ii., p. 237. [With one Plate.]
1859. On Fecundation in the two *Volvoces* and their Specific Differences; also on *Eudorina*, *Spongilla*, *Astasia*, *Euglena*, and *Cryptoglena*.—"Annals," Vol. iii., p. 1. [With one Plate.]
- „ On *Plæsonia* and *Kerona*.—"Annals," Vol. 3, p. 241. [With one Plate.]
- „ On Identity of Structure and Composition in the so-called Seed-like body of *Spongilla* and the Winter-egg of the Bryozoa.—"Annals," Vol. iii. p. 331. [With one Plate.]
- „ Descriptions and drawings of *Dracunculus*, and of several species of free Microscopic Filaridæ in the Island of Bombay.—"Annals," Vol. iv., p. 28. [With three Plates.]
1861. On the Natural History of the Lac-insect (*Coccus Lacca*).—"Annals," Vol. vii., p. 1. [With one Plate.]
- „ On a Bisexual Nematoid Worm which inhabits the common House-fly (*Musca domestica*).—T.B.M.S. No. vi., Appendix, p. lxii.; and "Annals," Vol. vii., p. 29. [With illustration.]
- „ Further Observations on the Natural History of the Lac-insect (*Coccus Lacca*).—"Annals," Vol. vii., p. 362.
- „ Notes and Corrections on the Organization of Infusoria, &c.—"Annals," Vol. viii. p. 281.

Geographical, Ethnological, and Antiquarian Subjects.

1846. Description of the Ruins of "el Bellad," formerly a town on the Shore, in the Province of Dofar on the South-east Coast of Arabia.—*Jour. Roy. Geograph. Soc.* Vol. xvi, pl. 2, p. 187; and with additions, in *Trans. Geograph. Soc. of Bombay*, Vol. vii. p. 225. [With one Plate.]
1847. Notes on the Gurrah Tribe of the South-east Coast of Arabia.—*J.B.A.S.* Vol. ii, p. 195. [With a Plate.]
- „ Notes on the Mahrarh Tribe on the South-east Coast of Arabia, with a short Vocabulary of their Language, and further "Notes" on the Gurrah.—*Idem.* Vol. iii., p. 339.
- „ Description of the Frankincense Tree of Arabia (*Boswellia papyrifera*); with remarks on the misplacement of Ptolemy's "Libanophorous Region."—*Id.* Vol. ii, p. 380. [With one Plate.]
1849. A Geographical Description of certain parts of the South-east Coast of Arabia, to which is Appended a short Essay on the Comparative Geography of the whole of this Coast.—*Id.* Vol. iii., pt. 2, p. 224.

Medical Subjects.

1847. On the Prevalence of Intermittent Fever among the Troops at Hydrabad in Sind during the Autumn of 1843.—*T.B.M.S.* No. viii, p. 32.
- „ Beriberi among the Marines of the Indian Navy on board the H.C. Surveying Vessels "Palinurus" and "Nurbudda," between Nov. 1844 and June 1846.—*Idem, id.* p. 78.
- „ Rupture of the Interventricular Septum of the Heart from External Violence.—*Id. id.* Appendix, p. 97.
1849. Six cases of Poisoning by Opium examined after death, with Observations; also a case illustrative of the passage of Mud into the Minute Bronchi, during Drowning. *Id.* No. IX. p. 35.
1853. Medical History of the "Central Schools" of Bombay for the Five Years ending the 1st July 1852, including a Visitation of "Measles."—*Id.* No. I. (New Series), p. 128.
1855. Note on *Dracunculus* in the Island of Bombay.—*Id.* No. ii. p. 45 and "P.S." p. 252.
- Medico-legal Cases of Rare Occurrence.—*Id, id.* p. 312.

1855. Further Observations on *Dracunculus* in the Island of Bombay.—*Id.* No. iv. p. 215.
1859. Medical History of the "Central Schools" continued from the 1st July 1852 to the 31st Dec. 1858, including another Visitation of "Measles"—*Id. id.* p. 253.—(For subsequent accounts see the Annual Reports of these Schools.)
- „ Note on Leeches in Western India.—*Id. id.* p. 18.
1861. Note on the Possibility of the Guinea-Worm entering the Human Body, in an Embryo State, through one of the Sudorific Ducts, deduced from an instance in the Vegetable Kingdom.—*Idem*, for No. vii. (unpublished).
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APPENDIX.

*Abstract of the Proceedings of the Society for the Years
1856-57, 1857-58, 1858-59, 1859-60; and 1860-61.*

MEMBERS ELECTED.

FROM THE 24TH NOV. 1856 TO THE 30TH NOV. 1857.

J. P. Hughlings, Esq.	Mungoldass Nuthoobhoy, Esq.
	B. P. Rooke, Esq., M.D.

FROM THE 30TH NOV. 1857 TO THE 29TH NOV. 1858.

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Rev. R. Montgomery.	A. J. Lewis, Esq.
J. S. White, Esq.	J. P. Bickersteth, Esq.
Brigadier J. M. Shortt.	T. F. Punnett, Esq.
	Nowrosjee Manockjee Wadia, Esq.

FROM THE 29TH NOV. 1858 TO THE 28TH NOV. 1859.

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Dr. J. P. Stratton.	A. Hay, Esq.
A. G. Stark, Esq.	Dr. Reynolds.
Captain F. G. Newnham.	Hon'ble Sir J. Arnould, Kt.

FROM THE 28TH NOV. 1859 TO THE 26TH NOV. 1860.

Major B. K. Finnimore.	Rev. D. Macpherson.
H. Newton, Esq., C.S.	T. Diver, Esq., M.D.
J. A. Forbes, Esq.	George Foggo, Esq.
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	J. Gibbs, Esq., C.S.

Honorary Members.

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FROM THE 20TH NOV. 1860 TO THE 25TH NOV. 1861.

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K.C.B.	A. D. Robertson, Esq., C.S.
Framjee Nasserwanjee, Esq.	Cursetjee Rustonjee Cama, Esq.
M. J. M. S. Stewart, Esq., C.S.	W. D'Oyly, Esq., C.S.
Rev. J. E. Carlile.	W. R. Cassels, Esq.
A. Faulkner, Esq.	G. Whitley, Esq.
E. L. Jenkins, Esq., C.S.	C. M. Keir, Esq.
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ANNALS of the Astronomical Observatory of Har- vard College. Part 1 of vol. I.....	Smithsonian Inst.
ANNUAL Police Return, showing the State of Crime in the Town and Island of Bombay during the year 1856	Govt. of Bombay.
ASSOCIATION, Bombay, Third Petition to Parlia- ment from the Members of	The Association.
BALFOUR (E., Esq.), Catalogue of Books in the Library of the Govt. Central Museum, Madras.	Govt. of Madras.
—— Catalogue of Mollusca, Government Central Museum, Madras.....	—————
—— Classified Catalogue of the Raw Products exhibited at the Madras Exhibition of 1857 ..	—————
BERKLEY (J. J.), Address delivered at the Annual Meeting of the Bombay Mechanics' Institution.	The Author.
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DONORS.

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_____ official, regarding the Ford Wah, in the Shikarpoor Collectorate, Sindh, for 1855-56 ...	_____
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GEOLOGICAL SURVEY of India, Memoirs of the, with a Map. Part 1 of Vol. I. Pub. by order of the Govt. of India. (2 copies)	Govt. of India.
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HIGGINS (Godfrey), on the Rosetta Stone	Genl. J. Jacob.
INDISCHE Studien Beitrage fur die Kunde des Indischen Alterthums von Dr. A. Weber. Vierter Band, Erstes Heft	The Author.
INSTITUTION, Royal, of Great Britain, Notices of the Meetings of the Members of. Part 6 for 1855-56	The Institution.
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LASSEN (Chr.), Indische Alterthumskunde, Vol. I.	The Author.
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—— connected with the Lapsed Sattara Territory and the Districts belonging to the Sattara Jagheerdars	_____
MORRIS (J.), Cases disposed of by the Sudder Dewanee Adawlut of Bombay. Parts 1 to 3 of Vol. III. Compiled by	_____
—— Cases disposed of by the Sudder Foujdaree Adawlut of Bombay. Nos. 2 to 6 of Vol. VI., 1 to 4 Vol. VII. and 1 to 2 Vol. VIII. Compiled by	_____
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PAPERS regarding the Revenue Settlement effected in the Districts of Omercote and Thurr	_____
PLAYFAIR (Lieut. R. L.), Memoir on the Ancient Reservoirs at Aden	_____
PORTRAIT of Dr. Morehead (Lithograph)	G. Med. College.
PURGSTALL (Baron Hammar), Geschichte Wassaf's Persisch herausgegeben und Deutsch Ubersetzt. I. Band	The Author.
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—— on the Results of different Methods of Treatment pursued in Epidemic Cholera	_____
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—— of the Medical Council, to the Right Hon'ble Sir B. Hall, Bt., in relation to the Cholera Epidemic of 1852	_____
—— 8th and 9th Annual, of the Board of Regents of the Smithsonian Institution	Smithson. Inst.
—— on the Observatories of His Highness the Rajah of Travancore, at Trevandrum, and on the Agustier Peak of the Western Ghats, by J. A. Broun, F.R.S. (3 copies)	Genl. Cullen.
RE'VUE de l'Orient de l'Algérie et des Colonies, Mai 1857	_____
RIVARA (Eliodoro de Cunha), Grammatica da Lingua Concani	The Author.
ROMER (John), Letter to the Editor of the Bombay Quarterly Review	_____
SOCIÉTÉ (Paris) de Géographie, Bulletin de la. Ts. IX. to XIV. Nos. 67 to 72 of Tome XII., Nos. 73 to 78 of Tome XIII.	The Society.
—— Impériale des Sciences Naturelles de Cherbours, Mémoires de	_____

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——— Monthly Notices of, containing Papers and Reports of the Proceedings of, from November 1854 to June 1855.....	_____
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——— Madras Literary and Scientific. Nos. 1 and 2 of Vol. I., 1857. No. 3 of Vol. II. for 1857.	_____
——— Bombay Geographical, Transactions of, Vol. XIII. from March 1856 to March 1857	_____
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——— 33rd Annual Report of ditto, for 1856	_____
——— Royal, Proceedings of. Nos. 23, 24, and 25 of Vol. VIII.	_____
——— Royal Geographical, Journal of. Vol. XXVI.	_____
TASSY (M. Garcin de), Discours de, à l'ouverture de son Cours d'Hindoustani. (Decem. 1856)	The Author.
——— "Mantic Uttair," ou le "Langage des Oiseaux," Poème de Philosophie Religieuse par Farid-Uddin Attar, translated by.....	The Translator.
——— La Poésie Philosophique et Religieuse chez les Persans d'après le "Mantic Uttair," 3rd Ed.	The Author.
——— Note sur les Rubaiyat de Omar Khaiyom. 1857	_____
TAYLOR (Rev. W.), Report by, on the Elliot Marbles	Govt. of Madras.
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ZEITSCHRIFT der Deutschen Morgenlandischen Gesellschaft. 10th Band, 4th Heft and 11th B. 1 to 3 H.....	The Society.

FROM THE 30TH NOV. 1857 TO THE 29TH NOV. 1858.

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ANTIQUARISK Tiddsskrift udgivet af det Kongelige Nordiske Oldskrift-Selskab, 1852-54	_____
BALFOUR (Dr. E.), Catalogue of Descriptive Geology, containing Hypogene and Volcanic Rocks, exhibited in the Madras Central Museum.....	Govt. of Madras.
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DONORS.

MORRIS (J.), Selected Decisions of the Sudder Dewanee Adawlut of Bombay, No. 4, 1857, compiled by	Govt. of Bombay.
— Cases disposed of by the Sudder Foujdaree Adawlut. Nos. 1, 2, and 3, of Vol. I. for 1861. Compiled by	—————
NIETNER (J.), Observations on the Enemies of the Coffee Tree in Ceylon.....	The Author.
OBSERVATIONS, Magnetical and Meteorological, made at the Government Observatory, Bombay, in the year 1859, under the Superintendence of Lieutenant E. F. Fergusson	Govt. of Bombay.
PAPERS relating to Irrigation in Bengal	Govt. of India.
— relating to Tea Cultivation in Assam	—————
— on the subject of the Cuttack Rivers. Parts I. and II. for 1860, with Plates and Sketches belonging to Part II.	—————
— relative to the Introduction of the Revised Rate of Assessment into the Moorbar Talooka of the Tannah Collectorate.—1861	Govt. of Bombay.
REPORT, Annual, of the Superintendent of the Geological Survey of India and of the Museum of Geology, for 1859-60 and for 1860-61	—————
— Annual, of the Grant Medical College, Bombay. 1860-61	Prin. G. M. Coll.
— relating to Suppression of Dacoity in Bengal, for 1859	Govt. of Bombay.
— of Crime and the Result of the Administration of Criminal Justice in the Bombay Presidency, for the year 1859	—————
— of the Bombay Chamber of Commerce for the year 1859-60	Ch. of Commerce.
— (56th and 57th) of the British and Foreign Bible Society for 1860, with Appendices	The Society.
— of Vaccination throughout the Bombay Presidency and Sindh, for the years 1858-59 ..	D. G. Med. Dept.
— of the Director of Public Instruction for the year 1859-60.....	Govt. of Bombay.
RIGBY (Lieut. Col. C. P.), Report on the Zanzibar Dominions	—————

DONORS.

SELECTIONS of the Bombay Government. No. LXIII. Annual Progress Reports of Executive Engineers, for 1858-59	—————
SILLAR (W. C.), a Month in the Cotton Districts near Bombay, by.....	The Author.
SCHLAGINTWEIT's (Messrs. H. and R. De), Theoretical Considerations and Tables in reference to Indian Hypsometry. Part I. of Vol. II. of a result of a Scientific Mission to India and High Asia. 1 vol. 4to 1861	The Authors.
SOCIÉTÉ' (Paris) de Géographie, Bulletin de la. Tome XX. for 1860	
SOCIETY, Royal Astronomical, Monthly Notices of, with supplemental notice. No. 9 of Vol. XX., Nos. 3, 5, and 7 of Vol. XXI. 1861	The Society.
———— Royal, Proceedings of. Nos. 38, 40, and 43 for 1860	—————
———— Royal Geographical, Journal of. Vol. 30th, for 1860	—————
———— Proceedings of, No. 1, Vol. V. 1861	
———— Bengal Asiatic, Journal of. Nos. 3 and 4, for 1860. No. 1, for 1861	—————
———— Madras Literary and Scientific. Vol. I. 8vo. 1834	—————
———— Bombay Medical and Physical, Transactions of. No. 6. New Series. 1860	—————
———— Royal Asiatic, of Great Britain and Ireland, Journal of. Part II. of Vol. XVIII. ..	—————
———— Madras Literary and Scientific. No. XI. of Vol. VI. 1861. New Series	—————
TASSY (M. Garcin de), La Poésie Philosophique et Religieuse chez les Persans d'après le "Mantic Uttair," 3rd Ed.	The Author.
———— Description des Monuments de Delhi en 1852	—————
THESAURUS Græcæ Linguae, with Index. 9 vols. Folio	B. Dajee, Esq.
TRAVANCORE, Description of the Administrative System of, in the year 1844, No. III. by V. Kristna Row	Genl. Cullen.

DONORS.

WALKER (W.), New Dock Scheme, with a Plan	The Author.
ZEITSCHRIFT der Deutschen Morgenlandischen Gesellschaft. 13th Band, IV Heft, and 14th Band, I. to IV Heft	The Society.

FOR THE MUSEUM.

FROM THE 24TH NOV. 1856 TO THE 30TH NOV. 1857.

Carbonaceous Shales and Shelly Limestone, speci- mens of, from the lower part of the Laterite cliffs at Vurkaly, 12 miles south of Quilon ..	Genl. Cullen.
Coins, copper (63), of the Pattan Sooltans, turned up by a villager while ploughing a field in August 1856, near Nandgaon, about six miles west of the Phondah Ghat*	Capt. G. Thomas.
— silver (13), discovered in some Excavations made in the ancient city of Wallabhae in Khat- tyawar†	Lieut. Trevor.
— silver and cornelian seals (1 bag of), obtained at Baghdad by Colonel Pope, presented to the Society for selection and report ‡	Col. G. Pope.
Corals and Nummulites, specimens of, from the Eocene formation in Sindh	Col. Turner.
Fossil Shells from the Chalk Formation, &c.; also specimens of minerals	Dr. Stuart.
Fossils, Cretacean, a box of, from Bagh and its neighbourhood, 18 miles north of the Ner- budda and about 145 miles from the sea; con- taining a fragment of an Ammonite, <i>Tere- bratulæ</i> , <i>Pecten</i> , <i>Janira</i> , and <i>Echinoidea</i>	—————
— from a yellow, arenaceous deposit of the Nummulitic formation, gathered round Kur- rachee in Sindh	Dr. Rooke.
— from the Nummulitic Formation in Sindh.	The Secretary.

* See "Proceedings," 1856-57, for further description. † *Idem*

‡ See "Unpublished Proceedings." 13th August 1857.

DONORS.

- Geological Specimens and Fossils from the neighbourhood of Nagpoor, containing :—1, of Granite with large crystals of mica and shorl; 1, of Amygdaloid Trap; 12, from the Sandstone formation, of which two bear impressions of *Estheria*; 4, of Worm-tracks in Shale; 4, of *Phyllothea*; and 1, of seed-vessels, in fine sandstone; together with one specimen of fine sandstone alone.—20 specimens from the Interrappean Lacustrine Formation, chiefly consisting of *Unio Deccanensis* with *Melania* and *Paludina Deccanensis*; 2, of the seeds of two species of *Chara*, viz. one *C. Malcolmsonii* and the other undescribed. The rest of the specimens bearing roots and seeds of various plants Rev. S. Hislop.
- Geological specimens illustrative of the rocks connected with the Coal or Lignite Deposit in the Lyneah Valley near Kotree, Sindh, consisting of :—1st, coal; 2nd, blue clay (plastic), with fragments of plants and coal; 3rd, red and variegated sandstone (loose), and sands; 4th, grey, compact limestone charged with *Alveolina*, and emitting an odour like sulphuretted hydrogen when rubbed; 5th, whitish, compact limestone charged with *Orbitolites*, *Alveolina*, and *Nummulites* (small); 6th, ferruginous clay and sandstone altered by heat. H. Inman, Esq.
- Gorgonia juncea*, specimens of, white, yellow, and red, from Bombay Harbour close to Mazagon Bunder. The Secretary.
- Graphite*, specimens of, (3) from Travancore, about 12 miles N. E. of Trevandrum Genl. Cullen.
- Laterite, specimens of, (12) from the cliffs about the same distance north of Trevandrum; bearing cylindrical fragments like the fossilized stems of vegetables J. A. Broun, Esq.
- Lignite, specimen of, from the Lyneah Coal-bed discovered by Captain F. Phillips, near Kotree in Sindh Col. Turner.

DONORS.

Shells (Fresh-water), from the neighbourhood of Rutnagherry	Dr. deCrespigny.
—— Marine, collection of, gathered at Rutna- gherry	—— ———
Trap and Laterite, specimens of, from Rutnagherry, showing the passage of the former into the latter	Dr. Broughton.

FROM THE 30TH NOV. 1857 TO THE 29TH NOV. 1858.

Birds (stuffed), viz : White Albatross ; large black Gull ; "Bonny Hulk ;" "Noddy," dark ; "Do." grey ; Cape Pigeon. From the Cape of Good Hope	Dr. Boate.
Clay Strata (hardened), and Red Sandstone, speci- mens of, from Jodpoor	Dr. Impéy.
Coins, silver (10), part of 65 dug up between Dhun- doka and Ahmedabad. Reported on by the President*	Govt. of Bombay.
—— gold (1), of Mahamood Shah III., king of Ahmedabad, who reigned A. H. 944 (A. D. 1538) to 916, (A. D. 1553). Discovered in a field at Shikoree	—— ———
—— gold (5), called "Hoons" or "Waharabs."	—— ———
Fossils (<i>Lagena</i>), two specimens of, from the Island of Karak in the Persian Gulf ; taken from the rock of which the Island is partly composed. .	Dr. Miller.
Geological specimens, a large collection of, chiefly from the Islands of the Persian Gulf, illustrative of the Miocene (?) formation of the Gulf†....	Lt.C.G.Constable
Image of Budh, part of, in relief, in dark Chlorite Schist, dug up at Peshawar, (in several pieces). It is of the same kind of schist and in the same style of sculpture as the remains already in the Museum, which were brought from Gimal Giri, about 30 miles north of Peshawar.	Dr. Birdwood.
Laterite, specimens of, from Matharan, including a pisi-form variety	Dr. Leith.
—— specimen of, pisi-form, and Manganese from Laterite, at the Phonda Ghat.....,.....	—— ———

* See "Proceedings," 10th Sept. † See Beng. Asiat. Jour. No. 27, p. 41. N. S.

DONORS.

- Limestone, specimen of, deep yellow, charged with Ammonites, apparently *A. opis* Sowerby (Grant's Geo. Cutch), from about 20 miles west of Jesselmeer. Also white and red fine, semi-compact, micaceous sandstone, the white bearing fossil-wood; from the road between Jesselmeer and Pokurn Dr. Impey.
- Nummulitic Fossils, consisting chiefly of Corals, Echinodermata and Bivalve Shells, from the vicinity of the coal-deposit in the Lyneah Valley, near Kotree, in Sindh; also specimens of white and blue clays and coal, from the carboniferous strata there H. Inman, Esq.
- Plants (dried), and a few geological specimens, with one bird's skin from Zanzibar. (These specimens were forwarded by Captain Burton, through an Apothecary of H. C.'s service, without written communication.)* Capt. Burton.
- Plants (dried), a book of, collected round Bushire. Dr. A. Burn.
- Shell-Bomb, of brass, and iron-shot found at Mooltan, where they were manufactured during the siege, by Moolraj Col. Honner, C.B.
- Tertiary deposit, specimens of (like the Shell-Concrete of Bombay), from Bushire Dr. A. Burn.

FROM THE 29TH NOV. 1858 TO THE 28TH NOV. 1859.

- Chrysalis of *Papilio Hector*, specimen of, from Dhoolia Govt. of Bombay.
- Coining Apparatus, consisting of double punches, iron-stand, and hammer, used formerly at Ahmedabad
- Coins, silver (15), of the *Gupta* dynasty, from the collection of H. H. the Raó of Cutch: presented by H. H. the Raó, through [Jacob. Genl. Le Grand
- Geological specimens from Galle, consisting chiefly of Granitic Rocks, collected and forwarded from that place for the Society by Dr. Buist.

* They have since been sent to, and received by Captain Burton, at the Royal Geographical Society.—*Ed.*

DONORS.

Gold, specimens of, in Quartz-Rock and Clay, from Melbourne, Australia	Rev. Dr. Wilson.
Guano, solid, fragment of, and in powder, from the Curia Muria Islands	B'bay Geog. Soc.
Lead and Iron Ores, specimens of, collected among the Hills of Beloochistan, by Major W. H. R. Green	Govt. of B'bay.
Quartz-Rock, auriferous, specimen of, from the "Victoria Gold Fields," South Australia . . .	[Esq.
Rupee (1) of Akbar Shah, the Victorious King, A.H. 1249; coined at Ahmedabad with the minting tools above mentioned	D. J. Kennelly,
	Hon. W.E. Frere.

FROM THE 28TH NOV. 1859 TO THE 26TH NOV. 1860. }

Coins, Bactrian (4), Electrotyped	Dr. Kane.
Fan, elaborately ornamented, made out of part of a leaf of the Talipot Palm and used in Ceylon on occasions of ceremony. Each Chief and Headman in Ceylon, when walking abroad is attended by a follower, who holds a fan of this kind above his head	Hon. W. E. Fere.
Fossil Shells, Marine, Eocene (?), a small collection of, from the Sub-Trappean deposit of Rajamundry, chiefly from Kateru, named and described by the	Rev. S. Hislop.
Geological specimens (2), from Hallanea the largest of the Curia Muria Islands. One characteristic of the Limestone (Eocene?), and the other that of the black Trappean rock which veins the granitic mountains there	Rev. P. Badger.
Plumbago, specimens of, from Ceylon	Hon. W.E. Frere.
<i>Rana</i> , Impressions of foot-prints of, on black-shale from the sluices in the Island of Bombay; found and presented by	Dr. Leith.
Rock-Specimens, Granitic, Metamorphic, and Sedimentary, from Travancore	Maj. Genl. Cullen.
Sculptured remains from the Island of Salsette. One sitting figure of Buddha, perfect, with the exception of the arms	E. W. West, Esq.

DONORS.

Shot, Stone-, specimen of, found at Dwarka	Hon. W.E. Frere.
—— hewn out of Laterite from Viziadroog	Lt. Dowell, I. N.
Steatite, grey, smoky, two specimens of, obtained 20 feet below the surface at Goonah in digging a well	Cap. H.P. Mayne.
Stones (2), sculptured in relief, from the remains of a large Structural Daghub close to the caves of Kanheri in Salsette, apparently representing a human sacrifice	E. W. West, Esq.
—— one from the same Daghub, with similar small figures in relief	Ditto.
Two Globular Vessels with lids rudely cut out of red stone (laterite?) about seven inches in diameter, taken from the small Topes or burial places close to the Caves of Kanheri in Salsette.	Ditto.

FROM THE 26TH NOV. 1860 TO THE 25TH NOV. 1861.

Armour and War Instruments, Chinese, specimens of, taken after the Bombardment of the Takoor Fort, consisting of a Helmet, Javelins, Cross- bow, Arrows, Musket, and Fuzees. Also some Chinese coins	Dr. Birdwood.
Basalt, columnar, of Salsette, specimens of, from Dharavee and Malar on the outside of the Island, also from Coorla	H. J. Carter, Esq.
Basaltic Scoriæ, specimens of, from the outer ridge of the Island of Bombay, just above Kambala . .	Dr. Leith.
Coin, plaster cast of, of the Sah Dynasty*	H. Newton, Esq.
Corals, <i>Madrepora</i> and <i>Meandrina</i> , specimens of . .	Dr. H. McDougall
Koran, copy of the, elaborately ornamented and written on a roll of paper measuring 10 feet and 10 inches in length by $\frac{3}{4}$ in breadth, obtained at Morabad	Sir A. Grant, Bt.
Lead and Copper Mines, specimens from the, near Ajmeer	Rev. Dr. Wilson.
Limestone, Nummulitic, portions of, coarse, yellow, charged with <i>Orbitoides dispansa</i> and a small nummulite of the class " <i>Striata</i> ," found in	

* See p. 15.

DONORS.

- situ* at Turkesur, about ten miles to the east of the Railway Station at the Keem river near Surat; ditto from Bhadee about 15 miles S.W. of Ruttunpoor, Rajpipla. Discovered and presented to the Society by A. Rogers, C.S.
- Limestone and Stalactites from the cavern of "Lahout" at Sha Bilawal in Beloochistan .. Col. Hough.
- Pegmatite, specimen of, from a large fragment found *in situ* in a narrow Basaltic Dyke in the Island of Caranja near the village of Ooran H. J. Carter, Esq.
- Porphyritic Trap, specimens of, from the neighbourhood of Tannah Dr. Leith.
- Pyroxene*, in black, rhombic, foliated crystals, on *Prehnite*, with *Laumonite*, *Chabazite*, and *Dodecahedral Calc-spar*, from the freshwater stratum intercalated in the trap of Nowrojee-Hill Quarry; the specimens also contain casts of *Cyprides*; discovered and presented by..... Dr. Leith.
- Rock-specimens from Japan, consisting of Mica Schist, Scorixæ, and old blue Limestone..... Comr. Robinson.
- Sand (iron), attracted by the Magnet, from the sea-shore at the Base of Malabar Hill Dr. Leith.
- Selenite, from the Salt-works at Patree on the Runn, 80 miles N.W. of Ahmedabad Dr. Kane.
- Trap-clay, specimens of, from between beds of Trap under the Fort of Sattara Dr. Leith.
- Water, mineral, specimens of, from the hot springs at "Tonk" or "Tong," about 80 miles west of Hydrabad Col. Hough.

ORIGINAL COMMUNICATIONS.

FROM THE 24TH NOV. 1856 TO THE 30TH NOV. 1857.

PRESENTED BY

- Broughton (Dr. F.), Description by, of some Cave-Temples and Rock-Excavations about seven miles from the sea, on the Western Coast of India, near Wagotun, in a letter to the Rev. Dr. Wilson, *Honorary President** Rev. Dr. Wilson.

* This Journal, vol. v. p. 611.

PRESENTED BY

Broughton (Dr. F.), on the Transition of Trap into Laterite*	Dr. Don.
Carter (H. J., Esq.), on the Ultimate Structure of <i>Spongilla</i> ; with further "Notes" on the Fresh-Water Infusoria of the Island of Bombay†	The Author.
—— on Specific Character, Fæcundation, and Abnormal Growth, in <i>Ædogonium</i>	
DeCrespigny (Dr. E. N. C.), Notice by, of 84 Species of Testaceous Mollusca from Rutnagherry‡	The Secretary.
Dhunjeebhoy Framjee, on the Origin and Authenticity of the Iranian Family of Languages§	The Author.
Extract from a Report by Lieutenant Wilkins, Executive Engineer, Aden, containing a Statement of all the different Attempts and their Results, which have been made since our occupation of Aden, to increase the Supply of Water there 	Govt. of Bombay.
—— from a Note by Captain R. F. Burton, at Zanzibar, dated 28th April 1857, to the Secretary ¶	The Secretary.
Frere (W. E., Esq. C.S., <i>President</i>), Report by, on thirteen Silver Coins found among the Ruins of Wallabhi in Kattyawar**	The Author.
—— Report by, on a bag of Coins obtained at Bagdad††	_____
—— Report by, on a Gold Coin discovered in 1854, in the Inam Field of Khunderow bin Mulharow, Patell of Sickoree, and submitted for examination by the Government‡‡	_____
Inman (H., Esq.), Letter, with Geological Specimens and Diagrams of the different Deposits passed through proceeding from the right bank of the Indus to the newly-discovered Coal-Deposits in Lyneah Valley, Sind§§	_____

* This Journal, Vol. V. p. 639. † *Id. id.* p. 574. ‡ Unpublished.

§ See "Proceedings," p. xli. (In process of being published by the Author).

|| This Jour. Vol. V. p. 597. ¶ See "Proceedings," p. xxxv. ** *Id.* xxxvii.

†† See "Unpublished Proceedings," 13th August 1857.

‡‡ See "Proceedings," p. xl. §§ Recorded.

PRESENTED BY

Jacob (Colonel LeGrand), Genealogical and Historical Sketch of the Gohel Tribe of Rajpoots. Translated by, from a Document in the possession of the Bhaonuggur Raja*	The Author.
Richardson (A. St. John), Account by, of the Fort of Galna†	_____
Romer (J.), Letter by, on the Pahlavi of the Zend Avesta‡	_____

FROM THE 30TH NOV. 1857 TO THE 20TH NOV. 1858.

Carter (H. J., Esq.), Note by, on the Red-Colouring Matter of the Sea round the Shores of the Island of Bombay§	_____
——— Report by, on the Geological Specimens from the Persian Gulf, collected by, and presented to the Society by Lieut. C. G. Constable, I.N.¶	_____
Dhunjeebhoy Framjee, Esq., on the Origin and Authenticity of the Iranian Family of Languages. Part II. ¶	The Author.
Frere (W. E., Esq., C.S.), Report by, on the 1395 Coins sent by Government with their Letter No. 270, dated 30th January last**	_____
——— Report by, on Coins received from Lieutenant Trevor, of the Engineers, found in the Ancient City of Wallabhi in Kattiawar††	_____
——— Report by, on 40 Gold Coins, received from D. Davidson, Esq., Collector of Poona‡‡	_____
Hislop (Rev. S.), on Fossils from the Nagpoor State, &c.§§	_____

FROM THE 20TH NOV. 1858 TO THE 28TH NOV. 1859.

Bhawoo Daji, Esq., Translation by, of a Copper-Plate Grant from Goa 	_____
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* This No. p. 112. † *Id.* p. 143. ‡ See "Proceedings," p. xxxviii.
 § Ann. Nat. Hist. v. i. p. 258. || Bengal Asiat. Jour., New Ser., No. 97, p. 41.
 ¶ See Proceedings," p. xlviii. (In process of publication by the Author).
 ** *Id.* p. 11. †† *Id.* p. liii. ‡‡ *Id.* p. lii. §§ *Id.* p. lx. ||| *Id.* p. lxvi.

PRESENTED BY

Bhaú Daji, Esq., Discovery by, of Historic Names and a Date in the Kanheri Cave-Inscriptions.*	The Author.
Buist (Dr. G.), Geological Observations by, on the Quarry and Intertrappean Neptunian Stratum of Nowrozjee Hill†	_____
Carter (H. J., Esq.), Identity in Structure and Composition of the Seed-like Body of <i>Spongilla</i> , with the Winter-Egg of the Bryozoa‡	_____
Frere (Hon. W. E.), Report by, on 236 Silver Coins, the property of H. H. the Rao of Kutch, forwarded by General leGrand Jacob to the Society, for examination, with the request that the Society would select some for themselves and return the rest to His Highness§	_____
Luxumun, Keru, description by, of a dial-instrument for finding out corresponding dates of the Hindu and Christian Eras, from the beginning of the Shalivahan Era to the end of the 30th Century	B. Daji, Esq.

FROM THE 28TH NOV. 1859 TO THE 26TH NOV. 1860.

Bhaú Daji, Esq., On the Sanscrit Poet, Kalidasa¶	The Author.
Carter (H. J., F.R.S.), Observations on the Natural History of the Lac-Insect (<i>Coccus Lacca</i>)*.	_____
—— concluding Remarks by, on Geological Specimens from the Persian Gulf, &c., collected by C. G. Constable, I.N.††	_____
West (E.W. Esq.), Copy of the Kanheri Inscriptions viz. 64, in 8vo. with Descriptions in English of their respective Localities, Size, &c. and a Plan of the Caves‡‡	The Author.

* See Appendix, p. lxvi.

† “*Idem*, p. lxxvii.

‡ Ann. Nat. Hist. v. 3, p. 331.

§ See Appendix, p. lxxviii.

|| Recorded.

¶ This No. pp. 19 & 207.—The Society possessing nothing but the “Titles” of Mr. Bhaú Daji’s other communications for this year, they are not inserted.—*Ed.*

** Ann. Nat. Hist. v. vii. p. 1. †† Bengal Asiat. Jour., N. S., No. 105, p. 359.

‡‡ This No. p. 1.

Wilson, (Rev. J., D.D.), Memoir by, of the Honorable Mountstuart Elphinstone*	PRESENTED BY The Author.
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FROM THE 26TH NOV. 1860 TO THE 25TH NOV. 1861.†

Bellasis (A. F., C.S.) on Old Tombs in the Cemet- eries of Surat ‡	The Author.
Carter (H. J., F.R.S.), further Observations by, on the Natural History of the Lac-Insect (<i>Coccus</i> <i>Lacca</i>)§.	_____
—— Description by, of a portion of Granitic Rock (Pegmatite) in a Basaltic Dyke about seven miles from Bombay, in the Island of Carinja 	_____
—— further Observations, by, on the Structure of Foraminifera and their larger Fossilized Forms in Sind, ¶	_____
—— on contributions to the Geology of Western India **	_____
—— Notes by, on the Geology of Salsette and other islands around Bombay††.	_____
—— Ditto on the Section of Trap in the Wes- tern Ghats exposed by the Cutting for the Bhore Ghat Incline Railway‡‡	_____
Glasgow (Rev. J., D.D.), on the Rotation, Figure, and Surface of the Moon§§	_____
Newton (H., Esq., C.S.), Note by, on a Coin con- nected with the Sah Inscription at Girnar 	_____
West (E. W., Esq.), description by, of some of the Kanhari Topes, with a Plan and Drawings¶¶	_____
—— Result of Excavations by in the Kanhari Cave No. 13, with Ditto Ditto***.	_____

* This No. p. 97.

† Mr. Bawú Daji's Communications for this year not having been received,
their "Titles" are not inserted.—*Ed.* ‡ This No. p. 146.

§ Ann. Nat. Hist. v. vii, p. 362.

** *Id.* p. 161.

§§ *Id.* p. 121.

*** *Id.* p. 157.

|| This No. p. 178.

†† *Id.* p. 167.

‡‡ *Id.* p. 15.

¶ *Id.* p. 31.

‡‡ *Id.* p. 181.

¶¶ *Id.* p. 116.

PROCEEDINGS, OFFICIAL, LITERARY, AND SCIENTIFIC.

FROM THE 24TH NOV. 1856 TO THE 30TH NOV. 1857.

Read a letter from Professor Sinclair, stating that, when he undertook to make a Catalogue of the Library, he anticipated being shortly relieved of some extra duties that he was then performing; but this not having taken place, he found that it was impossible for him to fulfil his intention, without making too great demands, probably, on his constitution.—11th December 1856.

With respect to the 63 Coins above mentioned, which were presented by Captain Thomas,* Dr. Leith stated that they had been found in a brass lota, not like that used in the neighbourhood at the present day, but like that used in Guzerat. The dates of those which Dr. Leith had deciphered were from A. H. 838 to 884, and the names mostly of the Koolburga princes; there were also the names of Egyptian Khalifs on them. The following is a list of those deciphered:—

Two copper coins of Abou-ul-Moozuffur Ahmed Shah Sooltan. 5, Muhumud Shah bin Muhumud Shah, 838,843. 5, Muhmood Shah bin Muhumud Shah Abou, 863. 1, Muhmood Shah bin Muhumud Shah Sooltan. 9, Abou-ul-Mughazee Muhumud Shah Sooltan. 11, Muhumud Shah bin Hoomayoon Shah Sooltan-ul-Motazein Shumsuldunya-ul-din, 884. 2, Hoomayoon Shah bin Muhumud Shah. 3, Muhumud Shah bin Hoomayoon Shah Sooltan. 24, Muhumud Shah bin Muhumud Shah Mahomed Shah.—12th February 1857.

A letter from J. Muir, Esq., enclosing a printed Prospectus of a Prize offered by him for a Treatise on the Vedanta System, in German or French, and forwarded for publicity in any way the Society might think fit, having been read, it was resolved—"That the letter and the Prospectus should be circulated for the consideration of the Committee of Management."†—12th March 1857.

Extract from a Note by Captain R. F. Burton, at Zanzibar, dated 28th April 1857, to the address of the *Secretary* of the Society:—

"We left Zanzibar on the 3rd January last, and went to Pemba and Mambas; stayed there a few days; sailed down the coast, and then

* See Presents for the Museum, p. xxiv.

† This was finally published in the daily-newspapers of Bombay.—*Ed.*

ascended the Pangany River. As there was little interest in this country, we marched up to Fuge in Wambara; came back late in February; all caught remittent fever,—the very type of the West African yellow fever and that of Madagascar. This drove us back to Zanzibar, where we are detained by the rains. I intend personally going over to Soudan, and inspecting the Copal diggings. During the “rains” is the best time, for then the men are actually at work. There is a little upon this island, but of very poor quality. No vessels will leave this before September, so it will be a long time ere our communications and specimens can come to hand. We start for the interior as soon as the rains end,—late in May or early in June. We expect to reach the great Lake in a couple of months. Our party will consist of twenty armed men, ourselves included, and 120 porters for baggage, food, presents, &c. Colonel Hamerton has been a kind friend to us; full of forethought, and most anxious that we should succeed. Sayud Mujid, the young Imaum, has promised us all the aid in his favour. We have no medical man with us, but it is only on the coast that it is said to be unhealthy; however, we should be glad of one for wounds. As yet, we have only had Hippopotamus shooting, killing as many as six in a single morning, the teeth of which form an export from this place. Zanzibar is dreadfully unhealthy; every European laid up with diarrhoea, and the natives as sickly.”

The Secretary observed, respecting the coal from Sind presented by Colonel Turner, (see p. xxv.) that it came from a bed “eight” (?) feet thick, about 28 miles N.W. of Kotree, and thirteen W. of the Indus. It appeared to be identical in character with the coal in the neighbourhood of the Upper Indus near Kalabagh, and with that lower down thirty miles west of Dhera Ghazi Khan; with that from the Bolan Pass presented by Dr. Leith; with that of Kurrachee; of the tertiary formation in Cutch; of that under the basalt in Bombay; of that under the laterite of Rutnagherry, and of that of the coast of Travancore (on which rests variegated sand strata, and then detrital laterite). Specimens from each of which places were in the Museum of the Society. All these carbonaceous deposits appeared to be of Eocene Age, and therefore could only be expected to yield a limited supply of fuel, which, if pure and free from pyrites, might be found very serviceable on the spot, but not of sufficient value for exportation. It was but one remove from brown coal or lignite; and a much greater link existed between it and the Burdwan Coal of India than between the latter and the coal of Newcastle, which, being the most compact of

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all, takes up the least room, while at the same time it affords in a given space, the largest quantity of material for combustion.—11th June 1857.

Report by the *President*, W. E. Frere, Esq., C. S., on thirteen Silver Coins found among the Ruins of Wallabhi, in Khattyawar.

“The coins presented by Col. Turner to the Society as having been found by Lieut. Trevor, of the Engineers, at Wallabhi consist of:—

Ten of *Aurungzeb*.

Of one of these I am not quite certain; but it must be either an *Aurungzeb* or *Akbar*; and as it clearly is not one of the latter, it is, I conclude, an *Aurungzeb*.

One of *Jehandar Shah*.

Two of *Furrukhsaer*.

Of the coins of *Aurungzeb*:—

No. 1.—Has the same legend as Marsden DCCCLXXXIII. p. 648, except that the coin is struck at Aurungabad (not Golcondah). It is dated A.H. 1097. A.R. is not legible.

This coin has a ring in it, and has been used as an ornament.

No. 2.—Has the same legend as the last, except that it is struck at Surat. It is dated A.H. 1103, A.R. 35.

No. 3.—A coin very much defaced; the legend as in the last; where struck is illegible, but from the similarity of the coin to No. 7, I conclude at Surat. It is dated A.H. 1104. A.R. is illegible.

No. 4.—The legend on this coin, so far as it is legible, is:—

از فضل حق سکه زربر سیم وزرپادشاه

“Per gratiam divinam summam ex auro et argento Imperator”—and the place of coinage Surat; the obverse being legible “A.R. 40.” It certainly is not like any of *Akbar's*; and though the legend is not to be found among those of *Aurungzeb* in Marsden, I still think it to be one of his coins, *Aurungzeb* and *Akbar* being the only kings who reigned 40 years.

No. 5.—A coin very much defaced; but from the dates “A.H. 1115” and “A.R. 48” being legible, it is evident that it is one of *Aurungzeb*.

No. 6.—A coin with the same legend as that of No. 2, although the dates are not in the same position. The date is curious,—۲۸۰۰ which might be 2800; or A.R. 28—A.H. 1100. The 28th year of *Aurungzeb*, however, was 1096; but this inconsistency is not uncommon in coins of *Aurungzeb*. Marsden, part II., p. 651, mentions one, dated A.R. 21, A.H. 76, whereas the corresponding A.H. to A.R. 21, would be 89.

No. 7.—Three coins ; much defaced ; the same legend as in the last, but the dates are not distinguishable, and they cannot be classed.

No. 8.—A very curious coin ; the shape and appearance of it is more like one of *Akbar's* than any of *Aurungzeb* depicted in Marsden, or any silver one of *Aurungzeb* that I have ever seen. However, the name "*Aurungzeb Alumgeer*" is perfectly distinct. I have in my collection a gold mohur of his very like it, though there are no dates upon it. My gold coin is dated A.R. 3.

A coin of *Jehandar Shah*, A.H. 1124, A.R. 1. Legend on Area I. as in Marsden's DCCCCIV., except here it is *چون مهر* for *برمهر* Area II. not so distinct as to where it was struck ; apparently Jehanabad.

A coin of *Farrukhseer*, A.H. 1126, A.R. 3. The legend the same as Marsden's DCCCCVII., except that this appears to have been struck at Ahmedabad, though the name is not clearly legible.

Another coin of *Furrukhseer*, A.H. is illegible, but A.R. being 6, it must be 1129. The legend is the same as Marsden's DCCCCVIII., except that the place of coinage is different, and what the place on this coin is I cannot make out ; the only letters legible being *حونر*.

These coins having been dug up at Wulli, I expected to find some very old ones,—that city, or rather "Wullabhi," having been destroyed in A.D. 524 ; but these coins could not have been buried then but some 1200 years later. As the Society have no silver coins of either *Aurungzeb*, *Jehandar*, or *Furrukhseer*, these will be an acceptable addition to their collection, although they are not of the same value to antiquaries as they would have been had they been coins of any king that could have been buried when Wullabhi was destroyed."—13th August 1857.

Read the following letter from J. Romer, Esq., to the address of the *Secretary* of the Society :—

"48, Gloucester Square, Hyde Park, 18th July 1857.

"SIR,—By 'book-post' I have the pleasure to send to the Society a No. of the 'Révue de l'Orient' for India.

"It contains a paper from me on the Pahlavi of the Zend Avesta, put into French by a friend.

"In a letter to the Royal Asiatic Society taking leave of the subject, I say, 'this paper will close my examination of the contested question of Zend (now Pahlavi) authenticity.'

"On looking over what I have written in endeavouring to dispel the obscurity, and to correct the errors in which the subject is involved, I

in it that, there appears to be a crescent in the front of the cap which there is not in the Sah coins ; while on the reverse, instead of the Chaitya symbol, we have what Mr. Thomas calls the figure of a man—the appropriate sign of the Buddhist layman. Prinsep (*Journal of the Asiatic Society of Bengal*. Vol. IV. p. 687) remarks that, the legend where best preserved appears a mere repetition of the letter “p,” with the prefix “i,” “u,” and “y.” Having succeeded in making the legend complete, I was in hopes that I might be able to decipher it.”

Mr. Thomas found those “admirable test-letters which were to form the word राज्ञा” and the highly important words महा लक्ष्मण, which conclusively establish the connection existing between those he had and the pure Sah money ; but even with this assistance and that afforded me by the modifications of the Sanscrit alphabet from the 5th cent. B. C. (*Jour. Beng. Asiat. Soc.* Vol. VII. p. 276), I was unable to make out the legend, and therefore called in the aid of Venaik Shastree who gave me the following reading of it :—

Boopatee Prutoo or Prutap raj Pomnapore Aseer,

which would agree with what Prinsep says, as I have above quoted ; but I could not reconcile myself with the legend, and therefore recommended him to reconsider it. This he has done and now suggests as the reading :—

Gupta Umerpoor Gupta Dama Poora Nurpooram,

but that neither corresponds with what Mr. Thomas has made out nor is it altogether consistent with itself ; the letters to which he gives the same equivalents having different forms, and I therefore must confess myself baffled, and would inform Government :—

“That the coins belong to a group as yet unattributed ; that we have separated ten out of the 19 coins and placed them in three packets ; as from them, when all placed in order, the whole legend becomes complete ; and that we hope that if sent to the Museum at the East India House, Dr. Wilson will be able to pronounce if these coins throw any light on history ; whether they supply the name of a new king, or whether the barbarization is so utter that, what appear to be letters are only a rude and ignorant imitation of the perfect coins of the Sah dynasty.”—10th September 1857.

“Report by the *President*, on a gold coin discovered in 1854, in the Inaum Field of Khunderow bin Mulharow, Patel of Sickoree, (Poona Collectorate,) submitted for examination by the Government.

“The legend on the *obverse* of this coin is—

"The Sultan Mahomed Shah bin Luteef Shah, 55.

"On the *reverse*—

"There is no other strength but in the Omnipotent, the author of the World and Religion."

"From which I conclude that this beautiful coin is one of Mahomed Shah III., King of Ahmedabad, who reigned from A.H. 944 (A.D. 1538) to 961 (A.D. 1853-4). He is called in Prinsep's Tables "Mahmood bin Luteef," but no such name is known on this side of India. In *Ferishta* and the *Miratee Ahmed*, as well as on this coin, the name is evidently "Luteef." I have never seen the coin in any numismatic description, and look upon it as very valuable. In my private collection is a copper coin of this same king, which was found at Cambay, and also two silver coins of this dynasty, one of Muzuffer Shah II., and the other of the last king of Ahmedabad, viz. Muzuffer Shah III., which were found at Ahmedabad. The characters of these very much resemble this one, but they are neither so perfect nor so beautiful. Those of Muzuffer Shah III. have the legend in Sanscrit as well as in Arabic."

The Rev. Dr. Wilson, *Honorary President*, having observed that he thought the former coin from the same parcel which had been mislaid was different from that examined by Mr. Frere, the *Secretary* was directed, in forwarding a copy of Mr. Frere's report to Government with the gold coin, to state that, if there were any difference from the one returned, the Society would feel grateful to Government for being allowed to examine those also.

Dhunjibhoy Framjee, Esq., then read his paper on the "Authenticity of the Iranian Family of Languages," of which the following is a short abstract :—

"The author stated that it was the first of a series of papers on this subject which he intended to bring before the Society. He confined himself on the present occasion to the Zend language, questioning the opinion of W. Schlegel, Sir W. Jones, Richardson, Van Kennedy, and Mr. Romer, that the language was fabricated by the Parsis after their emigration from Persia. He maintained that the language did formerly exist in Persia. He strengthened this assertion by saying that we meet with several Zend characters on blocks of stones at Behistun in Persia as well as with the cuneiform inscriptions. He advanced various ancient and modern authorities in support of his observations, forming his argument, more or less, on the representations of the following writers :—

Sixteen Original Communications have been read at the monthly meetings.

To the Library, 128 works, or 200 volumes, have been added by purchase, and 231 works or 543 volumes, consisting of about an equal number of octavos, quartos, and folios, have been rebound and repaired respectively.

The total number of periodicals, newspapers, calendars, army lists, and almanacs, received by the Society during the year, has been 88, viz. 56 Literary and Scientific, of which 23 are presented by the Societies who published them; 29 newspapers (European and Indian); and ten calendars, including almanacs and army lists, &c.

The printing of the XXth number of the Society's Journal, which completes the 5th volume, and extends up to November 1856, was concluded in July last, and issued the month following.

The subject of procuring a new catalogue of the books in the Library has continued to occupy much of the attention of your Committee, and it was finally arranged that two should be made—one alphabetically, according to the authors' names (which, of course, would require that all anonymous works should be entered under their own name, and not that of the author), and the other arranged according to the subjects treated of in the work; and your Committee were in hopes that they had secured the services of a gentleman fully competent to the work, who would complete it for Rs. 1,000 for his own remuneration and the pay of clerks.

On the 27th June your Committee were led to expect that, with the concurrent attention of the Librarian, one or two clerks for a month or two, would suffice, and they therefore reckoned upon procuring the catalogues for Rs. 1,100; and supposing the work had been begun in July, were led to expect that it would be finished by December.

But after further consideration, it was found that it would take at least four months to prepare the catalogues, and that two or three clerks would be required during that time. This, then, would very considerably increase the expense, which, for printing the two catalogues alone, would amount to Rs. 2,272; and it being evident that the Society's funds, unless some great increase of income or reduction of expenditure took place, would not bear such a heavy outlay, those members of the Committee who met on the 11th September determined that it was impossible for the Committee to recommend this disbursement, and that they would themselves, if possible, with the assistance of the Librarian, complete the alphabetical catalogue now under preparation.

As causes of the present low state of the Society's funds, the Committee would observe that in November 1852 the subscription of non-resident Members was reduced by one half, viz. from Rs. 30 to Rs. 15, without its being followed by any increase, but, on the contrary, by a decrease in their number since that period. Also at the same meeting it was resolved that a copy of each future number of the Journal should be distributed gratis to *all* members, instead of on payment of Rs. 2 as before; while the balance in favour of the Society being then large, the disbursements for new works and the rebinding and repairing of old ones for the Library has been kept up at a greater rather than a diminished rate.

The Committee would, therefore, recommend that henceforth the Society's Journal should be paid for by members as formerly.

Proposed by the Rev. Dr. Wilson, *Honorary President*, seconded by H. P. St. George Tucker, Esq., C.S., and carried unanimously:—"That the Committee's report be received, and the best thanks of the Society voted to them for their valuable services during the past year."

The balance-sheet of the Society's accounts for the past year having been laid before the Meeting, together with a list of the names of members in arrears, the *Secretary* was directed to again request the latter to liquidate their subscriptions.

Proposed by Dr. Leith, seconded by the Rev. G. Cook, and carried unanimously:—"That the best thanks of the Society be also voted to the auditors."

The *President* then mentioned that the Society had been induced by him last year, at the *Honorary President's* recommendation, to forward an application to Government that the services of Vishnoo Shastree should be secured to aid in deciphering the cave-inscriptions, and thus, being in some measure answerable for the appointment, it would be satisfactory to the Society to know what the Cave-Commission were doing.

The *Honorary President* in reply stated that, a report would in due time be made to Government of their proceedings; but that in the meantime he had much pleasure in informing the Society that very satisfactory progress had been made in deciphering the inscriptions of Karli, Salsette, and the Konkan, and that the Shastree, under his direction, was laboriously engaged in grouping their words, with a view to preparing and verifying a vocabulary which might be applied to the whole of them combinedly. He also mentioned that two copper-plate grants had lately been made out, the contents of which might soon be communicated to the Society.

The following gentlemen were then elected for the Committee of Management, Museum Committee, and Auditors respectively, for the ensuing year;—the *President*, *Vice-President*, and *Secretary* being considered re-elected :—

Committee of Management.

A. H. Leith, Esq., M.D.	Colonel H. B. Turner,
E. I. Howard, Esq.	H. L. Anderson, Esq.
Captain J. G. Forbes,	B. P. Rooke, Esq., M.D.
W. C. Coles, Esq., M.D.	Rev. G. Cook,
Thomas L. Jenkins, Esq.	Captain J. T. Annesley.

Museum Committee.

A. H. Leith, Esq., M.D.	G. Buist, Esq., LL.D.
H. J. Carter, Esq.	J. Harkness, Esq., LL.D.
Thomas L. Jenkins, Esq.	R. S. Sinclair, Esq., LL.D.

Auditors.

Captain J. G. Forbes,	Captain J. T. Annesley.
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Resolved.—"That, in accordance with the recommendation of the Committee of Management, members be called upon respectively to pay for their number of the Journal as formerly." The business of the meeting having been concluded, it was adjourned to Thursday, the 10th December next.

FROM THE 30TH NOV. 1857 TO THE 29TH NOV. 1858.

The *President* read the following result of his examination of 25 silver coins dug up in the new road between Dhundooka and Ahmedabad and forwarded for report with the 65 coins mentioned at p. xxxix :—

"I had entirely overlooked the accompanying 25 coins when reporting on the 46 coins sent to Government on the 8th October last (see p. xxxix.)

"These coins appear to be all of the same reign, although 13 of them are so much defaced that I can hardly trace their characters; the remaining 12 I have cleaned; and from the eight which I have separated, I make out the legend on the reverse to be :—

Parama Bhagavata Rajadhiraja Shri Kamara Gupta Mahendrasya.

"These coins are evidently not all from the same die. The head on some of them being, as Mr. Thomas remarks (Journal Royal Asiatic Society, Vol. XII., p. 65), "but little changed from the *Sak* type," while on one of them, in which the "r" before the *Gupta* leaves little

doubt but that it must be one of "Kamara Gupta," is of very inferior workmanship. Three of them have some of the letters of "NANO" or "PAO' NANO" in front, and three at the back of the profile; and I have no hesitation in saying that these are coins of *Kamara Gupta* described by Mr. Thomas in his paper to the Royal Asiatic Society, to which I have above alluded.

"The era of the *Guptas* is not, I believe, fixed further than that they reigned from the 2nd to the 5th century A.D., and that *Kamara Gupta* was the 6th king of that dynasty.* In the time of the full supremacy of the family, their empire clearly extended from the foot of the hills of Nepaul on the N.E. to the extremity of the peninsula of Guzerat on the S.W.; and it is therefore only to be expected that some of their coins should be found, as these were, between Dundooka and Ahmedabad. I cannot claim any originality for the information I have given. It is all, I believe, to be found in the volume of the Journal of the Royal Asiatic Society above mentioned. All that I can claim is having deciphered these particular coins, and having applied to them the information received from others."

Of the seven gold coins from the Poona Collectorate submitted at the request of the Society by Government for their inspection, with their letter No. 2756, dated 24th October last, Mr. Frere observed:—

"That the large one is a Joannese of 1784, Maria I. and her Husband and Uncle, Peter III., a common coin on this side of India, as might be expected from the neighbourhood of the Portuguese settlements.

"The other six are gold mohurs of the kings of Ahmedabad, viz:—5 of Mohomed Shah bin Luteef Shah, whose reign commenced in A.H. 944. These differ slightly from the one of the same parcels and reign already reported on (*antè*, p. xl. *et seq.*); and, although the legend is the same on all, their differing in a few particulars shows that they were not all struck with the same die. On the obverse are the figures 947.

"The other coin is of Moozuffer Shah II., son of Mahomed Shah I. Regarra, with the figures 924 on the obverse, and a different legend."

The Rev. Dr. Wilson, *Honorary President*, read an extract of a letter from the Rev. R. H. Th. Freiderich, Secretary to the Batavian Literary and Scientific Society, warmly thanking the Society for the

* Since the above was written, Dr. Wilson, our Honorary President, has pointed out to me that Major Cunningham has placed the era of Kuma Gupta as A.D. 430.

favour and honour conferred upon him by his election as an *Honorary Member*, and mentioning some of his present antiquarian pursuits.

On this last subject, Mr. Freiderich writes as follows:—

“The wish expressed by the Society that I might edit the *Brahmananda Purana* of Bali will, I hope, become a reality; but here again I must acknowledge the great obligations under which I am, principally to Colonel leGrand Jacob. The *Vishnu Purana* of Professor Wilson is certainly a very valuable, I might say inestimable, contribution for the prosecution of the study of the Puranas; but there is no text edited. The *Bhagavata Purana* being, as it seems, the youngest of all, will be of less comprehensive use. Both I possess; but only by receiving the text of some older Puranas, principally the *Brahmnanda Vaya Agni Purana*, I could hope to explain the certainly old Bali *Brahmnanda Purana*. By the kindness of Colonel leGrand Jacob, I shall soon receive the required works, and immediately commence the preparatory labours. Allow me yet to introduce to your notice the Rev. J. F. G. Brumund, of Batavia, member of the Direction of the Batavian Society, who has written formerly about Javanese antiquities and manners (“*Indiana*,” in two parts), and is now going to Holland to have a work printed descriptive of the magnificent temple of Boro Budo or Boro Budor. He is to leave Java at the end of this month; will stop at Ceylon about a month, and come to Bombay to get a glimpse of the wonders of your Cave-Temples.

“The Rev. Brumund will bring another letter from me, accompanied with three copies of an ‘*Essay*’ about inscriptions (written by myself), whereof the last sheets are printing.

“In my letter to Colonel leGrand Jacob, I have written something about the name *Yava* and *Malen Kolon* of Ptolemy. I differ in several points from my revered teacher, Professor Lassen. Also I cannot subscribe to his opinion that the island of Jambulos must be *Bali*, (I suppose you have received his *Ind. Antiq.* III. I.) Bali has not the Sago palm; and the civilization of Bali commences only a short time before the downfall of Majapahit when it was filled with Javanese fugitives, principally Brahmans. The common people in Bali retain, even to the present day, the remembrance of their having been cannibals (like the Battas and part of the people of Borneo, where, after all, some influence of the Hindoos is also visible, principally with the Battas). Now, if they were no more cannibals at the time of Jambulos than they are now, they would certainly not have kept the remembrance of a former state of life after two thousand years.”

On the origin and authenticity of the Iranian Family of Languages.
Part 2. By Dhunjeebhae Framjee, Esq.

"Continuing his dissertation, Mr. Dhunjeebhoy Framjee asserted that the Zend language was independent of the Sanscrit, and cited European authorities in support of this. He then contrasted the Zend with Sanscrit language by reference to comparative philology, in order to show that this was the case.

"After this, he analysed some of the Hajiographic words of the Zend Avesta and cuneiform inscriptions, to show that the Zend roots were met with in the latter; thereby concluding that the language of the inscriptions was no other than the sister Zend, and that the Zend Avesta existed prior to the Zoroastrians of India, quoting at the same time some of the Continental writers in favour of this opinion. He also maintained that the prophetic doctrine of Zoroaster was first promulgated in Bactria, and afterwards enthusiastically adopted by the ancient Persians, Medians, Soghdians, and Bactrians, in the reign of King Vis'aspes or Hystaspes, also that the Hajiographic books of the Zend Avesta were composed by the Persian prophet Zoroaster, in Bactria; and that the Zend stands as a primitive Hajiographic language of the Anti-Bakhdi or Balkh; while the other stands as domestic, in which cuneiform inscriptions were recorded at Hamadan, Van, and Behistan, and used as a popular language.

"Mr. Dhunjeebhoy next called attention to the Huzvaresh, or proper Pehlvi language, which he compared with the bilingual and trilingual Pehlvi inscriptions of Hajiabad, Nukshi, Rustom Nukshi, Rujah, and Kirmansha, and showed that several Huzvaresh roots could be found in the inscription-language. He argued that Pehlvi was now a current language in Luristan and Kurdistan, and that the people inhabiting the village of Diginar up to this day use the Pehlvi language in their intercourse with each other.

"In conclusion, he stated that he had mainly, if not entirely, indented on the Continental authors of Europe for the support of his arguments, leaving aside the Persian and other national authorities, with a view to avoid prejudice."—10th December 1857.

Copy of a letter, dated 6th October last, from the Rev. R. Freiderich, to Colonel leGrand Jacob's address, forwarded by the latter to Mr. Frere.

In this letter Mr. Freiderich states that he has found out "the real old names of Java and Sumatra in inscriptions from those islands; and

that what was long suspected and principally indicated by Marco Polo, that there were two islands called Java, is now an undoubted certainty." Mr. F. then goes on to prove this by references to these inscriptions in connection with what Marco Polo has stated respecting them, and also with what is contained in Ptolemy, who, Mr. F. observes, knew more than one Java, as he speaks of three islands called in charts and in editions "*Sabadibæ*." Many parts of the copy of Mr. Freiderich's letter, however, being illegible, the *Secretary* was requested to get a fair one of it made and sent to Colonel Jacob, for correction by the original, previous to its being recorded by the Society.—14th January 1858.

The following letters, with coins, were submitted by the Government, for the Society's examination and report :—

1. Letter No. 202 of 1858, from W. Hart, Esq., Secretary to Government, General Department, accompanied with seventeen silver coins discovered on the road between Ahmedabad and Dandooka in 1855.

2. Letter No. 270 of 1858, from W. Hart, Esq., Secretary to Government, General Department, accompanied with 1,395 silver coins, from Ahmedabad; also a letter, No. 159 of 1858, from G. Grant, Esq., Sub-Treasurer.

3. Letter No. 121 of 1858, from H. Morgan, Esq., Acting Collector of Tanna, accompanied with 181 silver coins (including two pieces of a broken coin); also letter No. 16 of 1858, from Dadobah Pandoorung, Esq.

4. Letter No. 247 of 1858, from W. Hart, Esq., Secretary to Government General Department, accompanied with two small gold mohurs.

5. Letter No. 186 of 1858, from W. Hart, Esq., Secretary to Government, General Department, accompanied with a large gold coin.

The *President* having, at the request of the Meeting, kindly consented to examine these coins, the *Secretary* was directed to deliver them, with the Government letters, into his charge for this purpose.—11th February 1858.

With reference to Government letters Nos. 202, 247, and 186, mentioned in the Minutes of last meeting, which, together with the coins that accompanied them, were then submitted to the *President* for examination, Mr. Frere states as follows :—

"No. 202.—The coins are so very much defaced, that I cannot

make out the legend on more than one of them, and that is so indistinct as to be of no use in a Museum. I would therefore return them to Government, with our thanks for their kind offer, of which, however, we do not wish to avail ourselves.

"No. 247.—These are two gold coins of Southern India, known in the Bazar (where the value of the larger is Rs. 3½, and of the smaller half that sum) as Kristnaree Hoons. Marsden mentions the Krishna Raja at page 737, as well as several other kinds of Hoons and Fanams. The inscription on the reverse of these is "Shree Prutap Hurree." Marsden mentions no Hoon with that inscription. Nor do I find in his "Numismata" any coin with the figures sitting in the same attitude, and the attitudes on these two coins are not the same. The Society have five or six different Hoons in their collection, and there are seventeen in mine, but none in either of these collections are the same as those sent by Government for report. We know very little of the history of these coins, though they are very various; and I should be happy to examine the other forty coins, which were discovered at Ausaree, to see if they resemble these or are of other varieties.

"No. 186.—On comparing this coin with the more perfect one on which I reported on the 18th December last, I find that the legend on both of them is the same, and that the legend as I read it on the 8th October last—

Thus:—

الواثق باملنان عولف الدنيا و الدين

Should be thus:—الواثق باله املنان ناصر الدنيا و الدين ابو الفتح

"On returning the coin, and thanking Government for giving me opportunity of correcting my report, I would request them to oblige me by making that correction in it."—11th March 1858.

Committee Meeting.—The *Secretary* having laid before the Committee a list of the periodicals and newspapers due at different times during the last two years which had not been supplied by Smith, Taylor, and Co., although orders for them had been since repeated frequently, also a list of books which had been ordered for an equal length of time without having been received; and having also stated that, no invoices were even sent with the books that were supplied, and that the Society's bill, which was not sent in till after a period of two years, instead of one, as customary, showed much confusion in the insertion of many books which were never received; while during the two years preceding Messrs. Smith, Taylor, and Co.'s having become the Society's book-sellers, Messrs. Longman and Co. had selected and forwarded to the

Society one-third more standard works and works of general reading, it was resolved that:—"The Secretary be requested to forward the statements he had made to Mr. Taylor for explanation; also that Mr. Taylor be supplied with a list of the deficient periodicals and newspapers, and requested to procure them for the Society with as little delay as possible."—19th March 1858.

Report by the *President* on the 1395 coins sent by Government with their letter No. 270, dated 30th January last.

"Three of these coins apparently belong to the Sah kings of Surashtra, as described by Mr. Thomas, p. 50, *et seq.* Vol. XII. of the 'Transactions of the Royal Asiatic Society.'

"On one, the legend is distinct and shows it to be a coin of Swami Rudra Saha, son of Swami Rudra Dama, the fourteenth king of that dynasty.

"The legend on the second is indistinct, yet I think I can decipher the letters 'Rudra;' but as no trace of the very remarkable letters 'Swa' are to be found, it is certainly not a coin of Swami Rudra. The name 'Rudra' being borne by five kings of this dynasty, and the legend being very imperfect, I cannot assign it to any of them.

"The third, though apparently belonging to the same series, is quite illegible.

- "The Sah kings are placed by Mr. Thomas from 157 to 57 B.C.

"Of the remainder, 1103 belong to what Mr. Thomas calls the 'Subspecies,' or to what Major Cunningham, in his 'Bhilsa Topes,' calls the 'Gupta dynasty.'

"On 270 of these the name 'Kumara' is perfectly distinct.

"On 238 more of them the same is partly legible, and on 595 there is no name legible, but I have little doubt but that they are all coins of the same king, viz. Kumara Gupta, whom Major Cunningham places as 6th of that dynasty, and about A.D. 430.

"These coins, however, are not all from the same dies, the workmanship of some being far superior to that of others. Curious collections might be made out of them.

"The remaining 283, many of which are of base metal, are similar coins to those which formed the subject of my report of the 8th October last, and which Government have sent to England for Dr. Wilson's opinion. Should they send only one-half of these, which are in excellent preservation, I have little doubt but that Dr. Wilson or Mr. Thomas would be able to decipher the inscriptions, or declare authoritatively that it is a mere imitation of a legend.

"The above accounts for 1389 of the coins ; there are six pieces, which I see are reckoned as six coins, and that accounts for the rest."

Mr. Frere also laid on the table the following report on the 181 coins submitted for examination by J. R. Morgan, Esq., Acting Collector of Tanna, with his letter No. 121, dated 23rd January last :—

"Of these, 11 appear to be of Kootboodeen Mobarik Shah, but have no dates on them legible.

"5 have 'Tughlik Shah' upon them, but the dates not being legible, I cannot tell to which of the Tughlik Shahs they should be ascribed.

"9 small silver round coins with the legend on the *obverse* :—'The most mighty sovereign Alaoodoonya-o-odeen,' and on the *reverse*, 'Abool Moozuffer Mohomed Shah the king, 703. Alaoodeen Mahomed Shah.'

"This king reigned from A.H. 695 (A.D. 1295) to A.H. 716 (A.D. 1316), and both his silver and gold coins are found in great abundance. Of the 19 in this collection eight have the date '2' only legible ; four have 703 ; two 704 ; two 714 ; two 15, and one 16, distinctly legible.

"5 round coins of Kootboodeen Moobarik Shah with the legend on the *obverse* :—'The most mighty sovereign Kootboodonya-o-odeen,' and on the *reverse* :—'Mobarik Shah, the Sovereign son of the Sovereign, 716.' This king in history, is stated to have ascended the throne in 717, but his predecessor, Alaoodeen, having died in the 10th month of 716, it would appear that Mobarik Shah first dated his accession from Alaoodeen's death, viz. from the 7th Mohurru 717, the time at which Ferishta fixes his accession. Mobarik having during the intervening period acted as minister of his youngest brother, Oomar, whom Kapur, the chief Eunuch, had placed on the throne.

"75 square coins, having on the *obverse*, in a square, 'Kootboodonya o-odeen,' and in the corners, 'Aboo-al-Moozuffir, the Khalif of God.' On the *reverse* :—'Mobarik, the Sovereign son of the Sovereign, 718.'

"39 coins bear the date 718 ; 28 bear 709 ; and 8 bear 720.

"50 round coins of Ghiasoodeen Tughlik Shah having on the *obverse* :—'The mighty sovereign Ghiasoodoonya-o-odeen,' and on the *reverse* :—'Abool Moozuffur Tughlik Shah, the sovereign.' 13 of these are dated 721 ; 19 bear 722 ; 9 bear 723 ; and 9 bear 724. So that these are a complete set of Ghiasoodeen's coins, as he ascended the throne in A.H. 721 (A.D. 1321), and was accidentally killed A.H. 725 (A.D. 1325).

"12 coins bear 'Tughlik' on one side, and 'Ghias' on the other, but apparently with the figure '6' on them. They resemble Ghiasoo-

deen Tughlik Shah's coins above, but the date could not be reconciled either with the 1st or 2nd Ghiasooddeen Tughlik Shah.

"Thus 177 of the coins are accounted for. There are three other pieces of metal which hardly bear the appearance of coins, and one coin that has been cut in two, which completes the number to 181. The coins are of no great value, though they may be useful to Numismatists to complete their collection."—8th April 1858.

Committee Meeting.—The *Secretary* having laid Mr. Taylor's letter on the table in reply to the *Committee's* complaints, and other papers which had been circulated to the *Committee of Management*, it was resolved, after a short discussion:—That the observations noted down at the time by the *President*, should be embodied by the *Secretary* in a letter to Mr. Taylor, which letter should be submitted to the Members present for approval. (See copy of letter after approval, No. 70, dated 8th May 1858, in the Letter Book.)—3rd May 1858.

Letter No. 1349 of 1858 from W. Hart, Esq., Secretary to Government, was read, returning the 1395 coins reported on by the *President* at the Society's meeting held on the 8th April last, and requesting that the Society and Mr. Frere would select 10 of these coins for themselves respectively, and return the rest.

Mr. Frere, at the request of the members present, kindly consented to make the selection.

Report by Mr. Frere on some coins received from Lieutenant Trevor, of the Engineers, which were found in the ancient city of Wallabhi in Kattywar:—

"The gold coin as it is called, is no coin at all, but an amulet or charm, with cabalistic letters impressed on it, whose meaning I have been unable to discover.

"There are 15 silver and 3 copper coins, to most of which a ring is attached, but so defaced that I cannot decipher them.

"Seven silver coins (to each of which is attached a ring), but the legend so defaced that I am not certain even that they are all coins; some may be only charms or ornaments.

"No. 1.—On two of them the Kaleema is distinct, &c. اٰلِیٰ with the addition of 'Ali, the friend of God.'

"No. 2.—On one side of one is the Kaleema, and on the other side (the obverse),—'May the most mighty God perpetuate his kingdom and reign.'

"No. 3.—On this one, only 'Adil Sultan Hussun Isphahan' is legible, from which it would appear to have been struck at Isphahan.

"No. 4.—This has only 'Nimroz' (?) on it.

"No. 5.—Has part of the Kaleema legible on one side, and on the other letters like 'thma' and 'Asma,' which may be part of 'Tahmasp.'

"No. 6.—On this the figures '92,' in every possible combination, is all that I can decipher. It will require a far better Numismatist than I am to ascribe these coins to any particular king, although I think I may safely say that they are not Indian but Persian.

"No. 7.—A silver coin, with the date '872,' the Kaleema, and names of the four successors round it, on one side; and on the other the only words besides the date which are legible are 'lo' and 'Ulmolakoo o alsaltanhoo.'

"Marsden gives no coins of *Behloli Lodi*, who reigned 1450 A.D. to 954, A.D. 1488; but the workmanship of this is superior to that of the coins which Marsden gives of his successor *Sekunder Behloli*, and his contemporary *Burbek Shah*. It also appears superior to those of *Behlol Lodi* given in Vol. X., p. 157, of the Numismatic Chronicle, and I do not find the benediction of his kingdom and reign on any of them. The workmanship being superior to that of the Indian contemporaneous kings, and the name of the Imaums of that date giving no reason to think it more probably Indian than Persian,—I, seeing with what other coins it is found, attribute it to *Hussun Ally*, who succeeded his father *Jehan Shah* A.H. 876.

"No. 8.—Six coins of '882' or '892.' So much defaced, that it is impossible to make out what (I imagine) is the obverse of them. On four of them the words 'The just king Yacoob' struck, are legible; and the same is also legible as being struck on the other two, although it appears more like the stamp or currency mark put by one king upon another's coins. The dates are legible, viz. 882 or 892. On the reverse, as I conclude it to be, in a square, is the sentence from the 99th chap. of the Koran, viz. 'Whoever shall have wrought a very little thing well, shall see it,' and there is something on the margin further in which I cannot make out. I had hoped that the length of the legend would have enabled me to have discovered among some of the described coins, whose these were, but I have been unsuccessful. However, I find in Malcolm's History of Persia that *Uzun Hussun* died A.H. 883, having ten years before become sovereign of a great part of the dominions of the house of Timour, and from his death until the elevation of *Shah Ismael*, the first *Sufi* king of Persia, and the first king of whose coins

Marsden gives any examples, a period of 26 years,—there were few events worthy of notice.

Uzun Hussun gave his daughter *Alum Shoaeh* in marriage to his nephew *Hyder*, who had three sons, *Aly*, *Ibrahim* and *Shah Ismael*; and on *Hyder's* death *Aly* was proclaimed his successor, but he and his brothers were seized by *Yacoob*, another descendant of *Uzun Hussun*, who confined them at Islakur for four years, when, taking advantage of the anarchy which followed on *Yacoob's* death, they made their escape, and *Aly* was slain. *Ibrahim* died in A.H. 898.

“I therefore conclude that the coins bearing date 882, with the apparent currency mark on them, are *Uzun Hussun's*, as recirculated by *Yacoob*; and that the others were coined during his assumption, if such it may be called.

“No. 9.—These, and the other coin with the legend ‘The just king Sumer Isphahan 898,’ are therefore valuable, even though so much defaced. The one with the legend in a lozenge on one side, and perfectly smooth on the other, and the word ‘Sumer’ on it, which I cannot understand, has more the appearance of an amulet than a coin; but it must be a coin, and clearly belongs to that obscure part of the Persian history between the death of *Uzun Hussun* and the reign of *Ismael al Safi*, with whom the history of modern Persia commences.

“No. 10.—Two coins. The year 916 is legible on one of these, and ‘Aladil al Sultan,’ but nothing more. On the reverse is the Kaleema round the legend, which is in four compartments, two of which contain the names of the Imaums ‘Mohomed’ and ‘Hussun’ in one, and ——— ‘Moosa’ and ‘Jaffer’ in the other; the rest of the coins and other names are illegible. The other coin is even less perfect, and the date is not legible on it; but the two appear very similar, and probably contain the names of the 12 Imaums, whom the Shiah consider as the rightful heirs of the Khalifat, and whose names are as commonly found on the Persian money as those of the four actual successors are upon the money of the Sunnis (Marsden, p. 460).

“No. 11.—Three coins of Baber. From two of these I make out the obverse to be a square with the legend ‘Zahiroddein Mohomed Baber, the victorious king, 937.’ Above the square is ‘The most mighty Sovereign,’ and below it, on one of the coins, (for on the other it is quite illegible,) ‘May God prolong his reign.’ On the reverse is the Kaleema in the area, and round it on the one, I can make out the words ‘By the fidelity,’ and on the other ‘The discrimination.’ From which I conclude that the margin contained the names of the four successors and their attributes. On the 3rd coin, in the margin of the

reverse 'Aboo,' apparently for 'Aboo Bekr the faithful,' and 'ain,' the first letter apparently of 'Omer,' is legible, which confirms my opinion.—10th June 1858.

With reference to Government letter No. 1461, dated 19th ultimo, in reply to the Society's, communicating Mr. Frere's report on the gold coins discovered in the Inam Field of the Patell of Sichoree, and forwarding seven of the same for the *President* of the Society to select two therefrom, one for the Museum of the Society and one for himself, Mr. Frere selected that mentioned in the list of presents to the Museum, for the Society,* and one of *Mahmood Shah* for himself; and proposed that, on returning the other five coins, the *Secretary* should present the Society's best thanks and his own to Government for these handsome and most acceptable presents.

With reference to Government letter No. 1349, dated 4th June, and the accompanying "Resolution" of Government (in reply to the Society's letter transmitting Mr. Frere's report on 1395 coins discovered in the village of Sanund in the Ahmedabad Collectorate), stating that the Sub-Treasurer had been directed to return these coins to the Society for the President to select ten for the Society's Museum and ten for himself, Mr. Frere observed that he had selected five of "*Kumara Gupta*," and five of the "undescribed species," for the Museum, and a like number for himself; and proposed, on returning the remainder, that the *Secretary* be requested to present the Society's best thanks and his own to Government for these valuable presents.

Report on forty gold coins received from D. Davidson, Esq., Collector of Poona. By W. E. Frere, Esq., *President*.

"I have received from the collector of Poona the forty gold coins Government did me the honour of directing him to send me.

"They are all Hoons or Warahas like those sent before, and on which I reported on the 11th March last, but they are not all the same.

"On 36 of them there are two seated figures, apparently *Vishnu* and *Luxamee*.

"On the reverse of seven of these the legend is *Shri Prutap Daew Raja*.

"On nine *Shri Prutap Dew Raee*, and on five *Shri Prutap Dew Raja*.

"These are probably all coins of the same king, most likely *Devappa*.

who reigned in Mysore about the beginning of the seventeenth century ; a predecessor of *Kanterava Nursa*, of whose coinage I have a specimen in my collection.

"On eleven of them the legend on the reverse is '*Shri Prutap Hurri Hur*,' and I do not know to what race of kings to attribute these coins.

"On four others the legend is illegible. Of the remaining four coins,—

"On three there is a single figure like *Vishnu*, and they very much resemble that depicted in Moor's Hindu Pantheon, Plate 104, fig. 19 ; the legend on these, however, is perfectly legible, viz. *Shri Prutap Kista* or *Krista Raja*, and they are probably Hoons of *Kristna Deva* who reigned in Beejanuggur from 1508 to 1530 A.D. ; though the workmanship of these coins is superior to that depicted by Dr. Wilson in the 17th volume of the '*Asiatic Researches*,' p. 594.

"The last coin is much defaced, but has on the obverse a double headed figure of *Garura*, holding an elephant in each beak and each claw. The legend on the reverse is '*Shri Prutap V*.' and the rest illegible ; but the coin is exactly similar to one depicted in the '*Asiatic Researches*' quoted above, Plate IV., fig. 92, p. 595, which is attributed in Colonel Mackenzie's Catalogue, to *Siva Raj* of Coimbatore.

"I do not think any of these coins are rare, although I have none of them in my collection, and should be glad to buy specimens from these to add to it, if Government did not desire to keep them.

"As there are no dates on the coins, and as we know, from Dr. Wilson's paper which I have quoted above, that coins of this description were not only struck by the kings of Beejanuggur, but by those of Coimbatore, Mysore, and others, as well as by the Raja of Chandragiri after the overthrow of the Beejanuggur kingdom, and the subject has not as yet attracted the attention of numismatists, it would be very desirable that those possessing any of these coins should publish them, as, from comparison of workmanship and names, it is very possible that 'an approximation' might be made to the exact time and dynasty to which they should be attributed."—*8th July 1858.*

Committee Meeting.—Mr. Taylor's letter, requesting that he might be furnished with some definite instructions for selecting books for the Society having been read, it was resolved :—

That he should be requested to select them in the following order :—

1st. New works relating to the East, such as Travels, Languages, Literature, Antiquities, &c.

2nd. Works of General Literature, Science, History, Travels, and Memoirs.

3rd. The best Novels and Poems.—10th July 1858.

Government memorandum : No. 2037, dated 8th ultimo, in reply to the Society's letter No. 96, 31st July last, transmitting Mr. Frere's Report on forty gold coins received from the Collector of Poona, sends the thanks of the Right Honorable the Governor in Council to Mr. Frere, invites him to select three or four of them for himself, and four or five for the Society, and requests that the rest might be returned.

Mr. Frere kindly undertook, at the wish of the members present, to make the selection offered by Government.

With reference to Mr. Hall's letter, of the 8th June last, asking for a transcript of the copy of the Sanscrit Inscriptions in the Temple of Somnath possessed by the Society, the *Secretary* stated that the transcript of this inscription, now on the table, had been made by Vishnu Shastree for Mr. Hall, and would be forwarded to him directly.
—9th September 1858.

The *President*, who kindly undertook to arrange the Society's coins some months since, placed them on the table, and stated as follows :—

"I have now much pleasure in laying before the Society their cabinet of coins arranged in order, together with a descriptive Catalogue of its contents. The cabinet contains 49 gold coins, 431 silver coins, 525 copper coins, and 17 lead coins ; and has been arranged in the following order :—Roman Emperors, Egyptian Kings and Queens, Greek Princes of Bactria, Indo-Parthian Princes, Indo-Scythian Princes, Patan or Afghan Sultans of Hindostan ; Moghul Emperors of Hindostan, Kings of Gujerat, Kings of Malwa, Kings of Kulburga ; Kutch and Kattyawar Coins, Saurashtra Coins, Gupta Coins, Rajput or Cholan Coins, Buddhist Coins, Canouj Coins, and Coins of the South of India.

"Had the size of the cabinet allowed of it, I would have assigned a drawer to one or two of the above divisions, and have written the name of the coins or dynasty on the front of the drawer, but that, from being obliged to crowd sometimes parts of three divisions into one drawer, I have been unable to do.

"I hope my labours will induce some better numismatist to examine the coins which I have been unable to class and assign ; and then,

but not till then, I shall feel that I have done a good work. At present my only satisfaction is that I have dispelled some darkness, and discovered that there are many duplicates in the collection which it would be desirable to sell or to give to other collections; and I would earnestly suggest that some of them should be offered to Government for the Central Museum, as some acknowledgment of the liberality with which Government have of late presented us with coins. The subject, however, is one that probably falls properly within the province of the Museum Committee, to whom it should be referred.

"I cannot conclude without recording the great assistance I have received in arranging the coins of the Roman Emperors from my young friend the late Mr. Thelwall, of the Civil Service, whose early death, all those who knew his classical acquirements, and the industry with which he applied himself to the study of the oriental languages, must greatly deplore."

The Rev. Dr. Wilson, *Honorary President*, seconded by the *Secretary*, proposed the *Society's* thanks to Mr. Frere for the great trouble he had taken, and the very satisfactory way in which he had kindly arranged the *Society's* coins; also that the subject mentioned in the third paragraph of his Report should be referred to the Museum Committee, which was unanimously carried.

At the request of the meeting, Mr. Frere kindly undertook to examine the parcels of 13 and 50 silver coins respectively, laid on the table from Government for this purpose, with letters from W. Hart, Esq., and Captain Burke, Nos. 2247 and 171.—14th Oct. 1858.

With reference to the Government letter No. 2247, dated 19th September 1858, enclosing copy of one, No. 1674, dated 30th July 1858, from D. Davidson, Esq., Collector of Poona, with 13 silver coins, being part of 682 rupees of the old currency, found in a field situated in the village of Khanowty, Talooka Bhimthurry, and referred to the Society for examination and report, the *President* (W. E. Frere, Esq.), who kindly undertook to examine them at the last meeting, stated as follows:—

"These are thirteen different coinages of the old currency, as reported by Mr. Davidson, and all belong to such rupees as those which, when received by the Government officers, are not re-issued, but sent to be melted.

"On the order withdrawing these coins from circulation, I began to make a collection of them, and have now a cabinet of upwards of

one hundred different rupees current during my service in different parts of India, mostly on this side.

"Among the rupees sent us, five, viz. the *Fursee*, the *Sun Ankosee*, *Narayn Putee*, *Jumkhundee*, and *Bhatowdee* are not in my collection; the others are in my collection, though not always by the same name. Thus the "*Shree Sicca*" is known as the Ajmeer Rupee.

"Government have not, I believe, any collection of these now uncurrent coins. It is perhaps late for them to commence one, but at any rate this would furnish a commencement if they had any intention of preserving what, in a few years, it would be impossible to obtain.

"Should Government, however, have no intention of keeping these coins, I should feel grateful to them if they would allow me to purchase the five above mentioned to add to my collection; but as there are no duplicates of two of them, I cannot prefer my request if Government should determine to commence a collection."

As regards the Mint Master's (Captain Burke's) letter No. 171, dated 8th October 1858, forwarding 50 silver coins recently dug up in the Province of Broach, requesting that the Society would remit their approximate value to the Acting Collector of Broach, Mr. Frere, who also kindly undertook to examine them, states as follows:—

"These fifty silver coins are Rupees of some of the Patan, Affghan, or Ghorī Sultans of Delhi, viz:—8 of Ghiasooden Balban; 13 of Alaoodeen Mahomed Shah; 7 of Kootboodeen Mobarik Shah; 1 of Nasuroodeen Khoosroo; 5 of Ghiasooden Tughlik; and 16 of Mahomed Tughlik.=50.

"I have not had time to compare them with those in our cabinet, but there are some that I know are new to us, and I would advise the Society to purchase them by paying their approximate value to the Collector of Broach, after which we can easily dispose of those of which we have duplicates."

The best thanks of the Society having been accorded to Mr. Frere for the above reports,—the *Secretary* was requested to forward a copy of the former to Government, and to carry into effect Mr. Frere's suggestion respecting the latter.—11th November 1858.

The Rev. S. Hislop exhibited a large collection of Fossils from Nagpoor and its vicinity. Some were from the red shale of Korhadi, consisting of the foot-marks of a small reptile, and the tracks of an insect and various species of Annelids. These impressions had been made on successive rippled surfaces on the margin, most probably of a

sea. From the ichthyolite-bearing strata of Kota also there were shown insect remains, including a beautiful wing-cover of a cockroach, with the patches of color still preserved. From the same part of the country there had been procured very perfect specimens of the teeth of *Ceratodus*, from which Dr. Oldham would be able to throw considerable light on that peculiar genus of fishes. Mangali, (where had been found the Labyrinthodont, described by Owen under the name of *Brachyops laticeps*,) contributed to the collection the jaw of a small Saurian, together with an abundance of entomostracean and vegetable remains. The argillaceous strata of Kampti and its neighbourhood was represented by an insect-wing, and a number of the Ferns, stems, and seed-vessels, for which that formation is remarkable. Alongside of these there were placed similar Ferns, stems, and seed-vessels from the coal-beds of the northern part of Nagpoor Province, from which it was very apparent that the strata in both localities were the same. Of the five genera of Ferns that are common to both, only two, *Sphenopteris* and *Pecopteris* possess pinnate fronds, the other three, *Glossopteris*, *Teniopteris*, and *Cyclopteris* being characterized by simple or individual leaves. Mr. Hislop remarked that the genus *Teniopteris* occupied a sort of middle position between the other two, agreeing with *Glossopteris* in having a midrib, while *Cyclopteris* has none, and resembling *Cyclopteris* in its furcating venation, while that of *Glossopteris* is reticulate. The species of *Cyclopteris* discovered in Europe, as the name implies, are of a circular form, but those met with in the rocks of Nagpoor province, for the most part, are in shape like segments of a circle. In the beginning of 1853 Mr. Hislop submitted to the Society a paper, in which he showed the connection in age, between the labyrinthodont strata of Mangali, the fern-sandstone of Kampti, &c., and the coal-beds of the Damuda basin, all of which, he conceived, lay at the base of the Jurassic formation. On the present occasion the reverend gentleman laid before the meeting fossils illustrative of the conviction; and added that the progress of discovery had not materially altered his estimate of the age, which, if it was not the oldest Jura, might be considered the upper Trias,—the formation immediately underneath. The fossils found in the Mahadewa sandstone comprise exogenous stems, which, at the foot of Sitabaldi Hill, are completely charred, and a single specimen of *Paludina* found at the same locality, from the latter of which it is inferred that the formation, like that of the underlying sandstone, is of freshwater origin, though considerably more recent.

Mr. Hislop then exhibited his tertiary fossils which were very

numerous and interesting, consisting of remains of saurians, fishes both ganoid and cycloid, shells bivalve and univalve, and fruits and seeds. Among the saurian remains was a head, with a row of small teeth on the palate, as well as of larger, conical ones on the jaws. The freshwater shells from the intertrappean strata of Nagpoor were compared with a quantity of shells from a marine or estuary deposit found in connection with trap at Kateru near Rajamandri, and two of the species, a *Physa* and *Paludina*, were evidently common to both localities, demonstrating the perfect contemporaneousness of the formations at the two places. As the *facies* of the Kateru shells is Eocene, confirmation is hereby afforded to the argument, by which Mr. H. in 1853, from an examination of the freshwater fossils themselves, endeavoured to prove that Mr. Carter's "Intertrappean Formation" belongs to that oldest division of the tertiary; and as at Phizdura, in the Province of Nagpoor, the intertrappean freshwater shells are found mingled with the bones of huge mammals similar to those of the sub-trappean deposit at Jubulpoor, decided evidence is hereby obtained in favour of the position that these huge animals belonged to the Eocene age, and that they are to be separated from the more recent gigantic remains disinterred from the banks of the Nurbudda with which they have been too frequently confounded.

ANNIVERSARY MEETING.

MONDAY, 29TH NOVEMBER 1858.

The *Secretary*, at the request of the *President*, read the following report of the *Committee of Management* for the past year :—

GENTLEMEN,—During the past year eight Resident, and one Non-resident, members have been elected, that is, six more than last year.

To the library 185 works, or 248 volumes, have been added by purchase; and 207 works, or 406 volumes, have been rebound; 32 volumes repaired, and 84 newspaper files bound: 137 books, including pamphlets, have also been added by presents. The *Committee* regret that they have not been able to complete the catalogue, and they fear that, from want of funds and a proper person to superintend and complete the various disjointed parts, it will be long a *desideratum*.

There have been 17 donations for the Museum, consisting chiefly of coins from Government; while the whole of the coins belonging to the Society have been set in order, catalogued, and described by your *President*, who, by his indefatigable labours during the past year, has

recorded the contents of, and completed and rendered instructive this department of the Society, so far as it extends.

With the exception of the *President's* reports on the coins that have been submitted to the Society for examination, there have only been four Original Communications during the past year, hence there has not been sufficient for the publication of another number of the Journal.

The total number of periodicals, calendars, army-lists, and almanacks received by the Society during the past year has been 89, viz. 67 literary and scientific, of which 24 are presented by the Societies who publish them; 29 newspapers (European and Indian), and 10 calendars, almanacks, and army-lists.

The Society's funds, as per balance-sheet laid before the meeting, shows a little larger sum in favour of the Society than that of last year; but had the disbursement for books purchased by the Society independently of the booksellers' selection, together with the disbursement for binding, been equally great with that of last year, there would have been much less; especially if another number of the Society's Journal had been published. Hence the present balance becomes available for these purposes during the ensuing year.

Besides this there are outstanding subscriptions to the amount of Rupees 945, for the recovery of which your *Committee* would suggest that the *Secretary* be requested to repeat his applications at the instance of the meeting.

The Rev. Dr. Wilson, *Honorary President*, seconded by Bhawoo Dajee, Esq. moved that "the *Committee's* report be received, with the Society's best thanks to the President, Vice-Presidents, Members of Committee, and Auditors, for the trouble they have taken, and the satisfactory way in which they have conducted the affairs of the Society during the past year," which was carried unanimously.

Dr. Wilson also, as *President* of the Cave-Temple Commission, stated that, the Shastree, for whom the Society received a monthly allowance from Government, had been engaged under him during the past year in deciphering and collecting the Cave-Temple Inscriptions; that he had finished those of Carlee and Junir, and was going on with those of Ajunta, and that during next year, he (Dr. Wilson) hoped to be sufficiently advanced to be able to present a third "Memoir" to the Society on the oldest remains of art, and notes for history, in Western India.

In conformity with Article X. of the Society's rules, the following gentlemen were then elected for the Committee of Management, Museum Committee, and Auditors for the ensuing year; the President

remaining, Vice-Presidents, Secretaries, and Auditors, being considered re-elected.

To fill the vacancies among the Vice-Presidents caused by the departure of General Waddington, C.B., for Europe, and the painful loss sustained by the Society in the death of the Rev. P. Anderson, the following members, viz. Colonel G. Pope and A. H. Leith, Esq., M.D., were elected.

Committee of Management.

Captain J. G. Forbes.	W. C. Coles, Esq., M.D.
Thos. L. Jenkins, Esq.	B. P. Rooke, Esq., M.D.
H. L. Anderson, Esq., C.S.	Capt. J. S. Annesley.
Rev. G. Cook.	R. Willis, Esq.
E. I. Howard, Esq.	Bhawoo Dajee, Esq.

Museum Committee.

A. H. Leith, Esq., M.D.	H. J. Carter, Esq.
Thomas L. Jenkins, Esq.	G. Buist, Esq., LL.D.
J. Harkness, Esq., LL.D.	R. S. Sinclair, Esq., LL.D.

Auditors.

Captain J. G. Forbes.	Captain J. T. Annesley.
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It was proposed by Dr. Leith, *Vice-President*, seconded by the *Secretary*, and unanimously carried—"That the 'Statistical Review' should be added to the list of Periodicals, and that the 'Journal of the Royal Geographical Society' should be purchased from that Society, supposing the latter should not continue to present it."

The business of the meeting having been concluded, it was adjourned to Thursday, the 9th December.

FROM THE 29TH NOV. 1858 TO THE 28TH NOV. 1859.

A letter was read from M. J. L. Laporte, dated "Bordeaux, 1st September 1858," soliciting exchange of Indian insects, especially *Lepidoptera*, and marine and freshwater shells for the like, which he possesses from different parts of Europe, Africa, and America.

The Secretary was requested to take the first opportunity of making public M. Laporte's request.

Committee Meeting.—At a meeting of the *Committee of Management* of the Bombay Branch of the Royal Asiatic Society, held in its Library

Rooms on Tuesday, the 22nd February 1859, for the purpose of making arrangements for obtaining access to the galleries of the Library on the inside, which would become necessary after erecting the statue of Sir Jamsetjee Jejeebhoy, Bart., in the central door-way of the Library,—the following correspondence was laid before the meeting:—

No. 400 OF 1859.

To the SECRETARY B. B. R. Asiatic Society.

SIR,—I am directed to transmit to you the accompanying extract (paragraph 3) of a Memorandum submitted by me to the Honorable Board, and to inform you that the arrangements therein suggested have been sanctioned by Government.

(Signed) H. YOUNG, *Chief Secretary*.

Extract (paragraph 3) of a Memorandum by the Chief Secretary :—

“ It seems quite essential, to the preservation of the interior of the Town Hall in decent order, that the upper story should be cleared of the public offices of the Educational and Alienation Departments which are now held there. The Chief Secretary would therefore suggest that, the Alienation Department be at once removed to the quarters referred to in the 4th paragraph of the Committee’s letter now under disposal, and that the Educational Department be placed in a room on the basement story now occupied by the Geographical Society, which could be well accommodated in the smaller of the two rooms now occupied as the Educational Office; the other room being made over to the Royal Asiatic Society, by whom additional space is greatly required for the disposal of their valuable Library, and to allow of the removal from the vestibule (which they now disfigure) of the staircases by which access is obtained to the gallery.

(Signed) H. YOUNG, *Chief Secretary*.”

Bombay Castle, 14th February 1859.

The Committee, having examined the Society’s rooms and the office of the Director of Public Instruction with reference to the arrangements, which would be necessary for obtaining access to the galleries after erecting the statue of Sir Jamsetjee Jejeebhoy, Bart., in the central door-way of the Library, and after the making over to the Society of the room now used for the office of the Director of Public Instruction, resolved— “ That the staircases should be set up in the east corner of the Museum and at the east end of the gallery in the office of the Director of Public Instruction respectively, and that door-ways

should be opened into the gallery of the Library through the galleries of the Museum and office of the Director of Public Instruction over the doors which lead from those rooms respectively, into the Library."—22nd February 1859.

Abstract of an English translation of a copper-plate grant (from Goa) in the old Devanāgarī character, dated 4328 of the Kaliyuga i.e. A.D. 1247. By Bhau Daji, Esq.

"This Copper-plate Grant was found in Goa. The language is Sanskrit, the character the old Devanāgarī, and the date Kaliyuga Samvatsar 4348, or A.D. 1247.

"It consists of three copper plates, about 8 inches by 5, secured by a copper ring. On the ring there is a seal, on which is engraved the image of a lion and the sun and moon; and on the rim the following inscription in the old Devanagari character viz:— 'Śrī Kāma deva Bhūmipāla Shashtha deva pratishtapakah.'

"It commences with OM! and salutation to Siva. It traces the Kadamba dynasty to Jayunta, an incarnation of Siva. Several monarchs succeeded, but none named except Guhalla, who was mighty and renowned. Another king named Shashtha followed; he was succeeded by Jayakes'ī, from whom sprung Vijayārka, who was married to Mylala Mahādevī, daughter of Pérmadī, the Chalukya king.

"They had two sons, Pérmadī and Vijaya. Vijaya's son was Jayakes'ī (II.) who was succeeded by his son Tribhuvana Malla. His son was Shushtha, who in his old age, placed on his regal seat, his sister's husband.

"This last prince named Kama Deva made a grant of the village Bhatta in Gokapura (Goa), to the brahmana Vishnu dīkshita, in the year stated, viz. in the 5th of his reign.

"The place with its boundaries is now easily identified. This is the first Copper-plate Grant relating to the Kadamba dynasty, fully translated. The Kadambas, who ruled over Goa and Malabar, are shortly noticed by Messrs. Wathen and Walter Elliot, but in their notices there is a good deal of confusion."

Discovery of historic names and date in the Kanheri Cave-inscriptions of the island of Salsette. By Bhau Daji, Esq.

"At Kanheri, in the island of Salsette, in two caves, nearly opposite to each other and on each side of the ravine, two inscriptions not noticed before were discovered. In the inscription in the cave to the left as you

ascend, the word 'Swasti' and the date '799 Saka' in figures and words were made out. The name of 'Mahárájadhiraaja Kokalla' was also read, and other words, viz. 'Pravardhamána vijaya rájyè, rájádhirájá' and 'áchandrárkam datta,' can be made out, but a correct and complete rendering of the inscription would require a month's study on the spot, as many letters are destroyed. The inscription on the opposite large cave, known as the Durbar Cave, is larger, and contains the same date and the name 'Kokalla.' Casts of the date and of the name of the king taken from the rock inscriptions were exhibited. This 'Kokalla,' the writer believed, was the king of that name who belonged to the Sahasrárjuna or Kalachurí race mentioned in some of the copper-plate grants. The date of the inscriptions agrees with the age assigned to him in the copper-plate grants. This is the first instance of the discovery of dates at Kanheri."—*10th March 1859.*

Colonel LeGrand Jacob's note returns the following copy of Mr. Frederich's letter, dated Batavia, 6th October 1857, corrected (see p. xlviii); also requests the Society not to lose sight of Mr. Friederich's promise to get for him a "copy with translation" of the Bali Brahmanda Puran.

Colonel Jacob further states:—"As this is the only Puran that Bali has, I look upon it as likely to prove a mine of wealth by throwing light on the state of Hindoo society, religion, and literature at the time the great migration took place which established it in the Malayan Archipelago, reaching even to Borneo, where I saw monuments of the Lingum and Yuni. It would almost seem as if the Brahmanda was the only Purana then existing, else how can we account for this being the sole one known to the Malayan Hindoos.

"I have sent Mr. Friederich the Bhagvut Puran, and have had copied for him the Brahmanda, and some others are on hand, though I fear they cannot be completed before my departure. It will be a great point to have a comparison instituted between the Indian and Balinese version of the Brahmanda.

"I was in some hope, when a learned Shastree was added to the Society, that we should have done something in the matter of ancient Hindoo Literature, and have been disappointed at seeing no fruit. I sent him, i.e. Vishnu Shastree, some 2½ years ago, a bag of coins from Kutch (340 I think, but am not sure of the number), all Guptas I believe, and mostly of one dynasty; and as he is paid for the work, he ought to have made some report on them ere this. They belong to

His Highness the Rao of Kutch, and, after the Society have done with them, should be returned to the owner through the Political Agent, retaining necessary exemplars for the Society.

"I wish I could find time to give the history of the collections of Shas and Guptas with me, but I fear that I must reserve them for the Parent Society, and for the leisure of my furlough."

The *Secretary* was requested to ascertain from the Shastree what had become of the coins alluded to by Colonel Jacob.

Following is Mr. Freiderich's letter :—

Batavia, 6th October 1857.

MY DEAR SIR,

"I received your favour of 25th August, some 14 days ago, and I give you my best thanks for the iterated kindness shown to me. The acquisition of the Indian Purānas will be a great thing, and, according to your wishes I have addressed myself to people at Bali that I might receive two or three copies of the Brahmandapurāna from different places. I shall do my best to give a sufficient edition and translation (perhaps also in English, although this is difficult for me) of the same Purāna, which might be the better effected, because I am feeding the hope to be sent to Bali, as soon as my collecting of the Javanese inscriptions shall be finished. I am under very great obligations to you, Dr. Wilson, and Brigadier Hale for having presented, and to the Society for having named, me an Honorary Member. I have not yet given my thanks to the Society, having been very often and much sick, and not being able to give to the Society a token of my acknowledging the great and really undeserved honour conferred upon me, but I am now writing to Dr. Wilson to this purport, and offering some small information gained by me about Indian Antiquities in the Archipelago.

"You will, perhaps, hear with some pleasure that I have found the real old names of Java and Sumatra in inscriptions from those two islands. What was long suspected and principally indicated by Marco Polo, viz. that there were two islands called Java, is now an undoubted certainty.

"In the great inscription of Pageo Rugung (Menang Kabáu, Sumatra) that island is called Prathama Java (the first Java).

"In an inscription on a copper-plate from the north-eastern part of Java (given by Raffles, plate 85) our island is also called Java Drepa. Now we might understand how Ptolemy could say that Yava was rich in gold. Sumatra has indeed a great quantity of this metal, but Java none. That both were called Insulæ hordei (𑖦𑖯𑖫𑖜) is to be explained by their extreme fertility, and Yava, hordeum, might be taken as a repre-

sentative of all grain (hicalæ). Marco Polo calls Sumatra 'Giava Minore,' and this expression principally has puzzled the learned because Sumatra is greater than Java. But we might explain this easily. In his time, Java was a powerful empire, and had subjected nearly the whole eastern coast of Sumatra besides a great deal of other islands. The petty kingdoms of Sumatra were dependant upon Java, and their princes originated all, or partly from Java, as the families of Palembang, Jambi and others do in our times. The name Java had remained, and the people who were subject of our Java naturally considered this last as (महाजव) Mahá Yawa, whereby Sumatra became the lesser Java; Marco Polo did certainly not know the real extent of the two Javas. I find also a trace in Ptolemy that he knew more than one Java. He speaks of three islands called in charts and in editions Sabadibæ (Professor Lassen reads Saladibæ). If the first reading be the true one, I think we have here the same name as Jabadiu. S, would be the natural representative of j, ज (C) in Greek.

"The rest of the word is the same. If this be right, we find in Ptolemy's time already the corrupted form (जव), besides the old form (जव). The Arabs and Marco Polo knew only the first, whereas in the cited inscription of Raffles, जव yet appears in the year of Christ 1294. All that pleads against this explanation comes on the account of the contradictory reports of ignorant Greek and Egyptian sailors. They knew principally two great islands. Some of them had heard the name जव, others that of जव, which they and Ptolemy considered to be different. Some must even have heard of three जव, wherefrom the 'three Sabadibæ.'

"Now to fill up, we might add the two principal islands in the Straits of Sunda (either to Java or to Sumatra), viz. Prince's Island and Krakatan (or Karkata कर्कट). In the great confusion which the different reporters of Ptolemy everywhere show (in these eastern longitudes) there is no wonder that they displaced the 'island rich in gold' to the eastward of the Sabadibæ. How should they not have known Sumatra if they knew several islands to the eastward of it? That the small islands abovementioned could be named with the same name as the two great ones even by the natives, I think you might concede. Yawa was in those parts, but I don't extend this remark to the islands to the eastward and northward of our Java as a generic name.

"In Ptolemy's Μαλαϊοκαλον I see Cape Romania. Malen is rather to be derived from *Malaya* Malay, than from the Tamuli word Malai, a mountain (Professor Lassen), because he derives the word from the last, and supposes it to be Cape Tringam on the eastern coast of

Malace, as there is a mountain there, and at Cape Romania none. But I think that Tamuli words must be stated in a most accurate manner to be found to exist in the Archipelago, the non-Sanscritic words of India being hardly to be found in the languages of the Archipelago (only in some terms of the Navy).

"If the word Malen be not *Malai* we have certainly here Cape Romania, which is so very important to all sailors as the southern point of the continent, when they are getting out on into the dangerous straits. Cape Tringam could be very easily overlooked by the foreign merchants, but Cape Romania I think not. According to the Malay tradition they, the Malays, came only about 700 years ago from the interior of Sumatra. Also the meaning attached to the word Malaya in Javanese and Balinese, seems to indicate their having had no fixed abode,—it means runaways, vagabonds. For the last, there is a good reason in the international hatred. The first might be applied to one *single horde*, that came so late to Singhapura as the 7th century; the great inscription above alluded to is of Saka 578-656 A.D.

"There was already a highly civilized, great empire at Sumatra.

"The inscriptions of Kedah and Province Wellesly (Journal of Bengal) seem to be yet older. Even the fragments of the inscription of Singhapura show characters much older than the time when the town was taken by the Javanese from the Malays. It might be inferred that a population related to the later Malays of Singhapura, Malacca Johor, might have spread over the coasts of Malacca a thousand years before these Malays came, whose tradition is preserved by their having become Mahomedans shortly after, so the name Cape Malaya (Καλον is not cape but side, it was perhaps not called cape, because there is no promontorium), might have been the original one of Cape Romania. Malaya is explained differently, from the Javanese, in another way by the Malays themselves, but if rightly I don't know, and a just explanation would be difficult, if the name be so old and certainly not Sanscrit.

"If you like to have some communications of this kind I shall often write to you.

"I should like very much if you were to stay for some months at Bombay: a friend of a mine, also a Member of the Direction of our Society, the Rev. J. P. G. Brumund, is to leave Java on the 18th instant. He will stay about a month at Ceylon and come afterwards to Bombay, where he would like to see as much of the rock-cut temples of your parts as time and opportunity will allow.

"He has seen all the Antiquities of Java, and made a particular study of the great temple of Boro Budu.

"You recollect having seen here the excellent plates of that place. Now Mr. Brumund is to give a descriptive text to them, which he has nearly ready. Plates and text (in a French translation) are to be edited in Holland; the lithographing has since more than a year commenced.

"You understand that a visit to your Hindu remains will be most useful to Mr. Brumund, and I recommend him strongly to your kind assistance. Mr. Brumund will bring you the first ten sheets of my Essay on Inscriptions; a complete exemplar I will send next month by the mail.

Yours, &c.

(Signed) R. FRIEDERICH."

Government letter No. 927, dated 16th April 1859, transmits copy of a letter from E. Thomas, Esq., late Bengal Civil Service, which had been received from Her Majesty's Principal Secretary of State for India, in his Despatch, dated 11th January 1859, respecting certain Gupta coins which had been previously examined by the *President*.

It is as follows :—

"SIR,—In compliance with the request conveyed in your letter of the 9th ultimo, I examined the coins found at Sanund and forwarded by the Government of Bombay.

"The majority of these pieces have been so correctly assigned by Mr. Frere in his report [see p. li], which accompanied the communication of the Bombay Government, that but little remains to be said with regard to them, and so very large a proportion of the entire number are from the Mints of one and the same king, and of a type, moreover, previously well known, that they are found to offer but little either of historic or numismatic value.

"I may remark that the bulk of the coins are rightly attributed to *Kumara Gupta*, whose epoch, however, I have reason to think, in opposition to Major Cunningham, may be preferentially placed in the 3rd century A.D.

"Mr. Frere has exclusively assigned 508 of these pieces to the monarch in question, and I am further able to read his name in many cases and his distinctive titles in nearly all the legends of the 593 coins returned as doubtful.

"With advertence to the 283 coins on which my opinion is more expressly sought, I regret to say that the specimens now contributed do not in any way aid in the definitive determination of the purport of the legend they bear, in common with the extensive class of cognate mintages [to which they belong]. It is true that the coins themselves are in excellent preservation, but their die-execution is rude and faulty

in the extreme, more especially in respect to the formation of the letters which present the mere imitative semblance of the original characters, while other signs which should form a portion of the standard legend, are altogether omitted. I am in a position to state this much from a collation of their superscriptions with that on a well-executed coin of the same type, but of earlier issue, in the possession of Mr. G. H. Freeling, Bengal Civil Service, which, though incompletely legible, clearly developes the local title of *Bhataraka*, and the ordinary Surashtran prefix of *Raja Mahi Kshatrapa*, together with a name, the concluding portion of which may be doubtfully given as '*Agra Damne*.'"

I am, &c.

(Signed) EDWARD THOMAS.

"P.S.—The above was prepared some time since in immediate reply to your letter under acknowledgment, but I have delayed its transmission till I had an opportunity of submitting my original fac-similes to Professor Wilson, on his return to town, in the hope that he might be able to suggest a more comprehensive reading of the more accurately engraved legend on Mr. Freeling's coins; but on close scrutiny, it is found that, the abrasion of the edges of the piece in question forbids any positive interpretation beyond what I have given above."

Of the coining apparatus above mentioned,* Mr. Frere states as follows:—

"The set of minting tools which I have now the pleasure of presenting to the Society, were given to me by Government for that purpose.

"They were used in the Mint at Ahmedabad, which was abolished in 1836, and it is curious to think that, the British Government of that day, should have been coining Rupees at the same time in Bombay, in the perfect and beautiful Mint in front of our windows, and at Ahmedabad, not three hundred miles off, with these rude and inartificial tools.

"The tools consist of an anvil (*erun*) and a sledge-hammer (*ghun*). A reverse die to fit into the socket on the anvil (*jhakun*); and obverse die (*purkala*).

"The anvil was imbedded in a large log of Babool or Kyan wood, which was sunk in the ground, and the reverse die being fixed into the socket with wedges, the silver of proper weight and alloy was placed on it, and the obverse die held on the silver and struck with the hammer, the silver then became a rupee, such as we were accustomed to see in general circulation some twenty years ago.

* See Presents for the Museum, p. xxvii.

"The legend on the reverse die is:—

اکبر شاه بادشاه غازی سکه مبارک ۱۲۴۹

'The happy coin of Akber Shah the victorious king, 1249.'

"On the reverse the legend is —

ضرب احمد آباد سنه ۲۷ جلوس میمنت مانوس

'Struck at Ahmedabad the 27th year of his prosperous reign.'

"Chronologists will be surprised at seeing a coin of Akber's bearing date A.H. 1249, which extended from 21st May 1833 to 10th May 1834, and to find on the reverse the 27th year of his reign, which, had it been Akber Shah (Jelaloodeen Mohamed Akber), would have been A.H. 991. But their surprise at the confusion of dates will be changed into surprise at our timidity, when they recollect that, this is not an imitation or copy of a coin of the great Akber, but was the die used at a British Mint in 1833-34, and bears the title of the paramount sovereign in whose name we struck it, the then Puppet King of Delhi, Akbar II. (Abul Nasir Mooienoodeen Mahomed), who began his nominal reign A.H. 1221 (A.D. 1806), so that the 27th year of his reign would be A.H. 1248-49, A.D. 1833.

"My friend Mr. Jordan, the Deputy Collector at Ahmedabad (to whom I am much indebted for coins and information about them, not confined to those of the Ahmedabad mint), has been unable to procure me a rupee of A.H. 1249, and the one most resembling the die on these tools which I have been able to procure out of some thirty which Mr. Jordan sent me from my own collection is the one I now have the pleasure of presenting to the Society. It bears date Ak. 12, and, as far as I can decipher, A.H. 1234, which would be A.D. 1818.

"A comparison between this rupee and the die will show how small a part of the legend was transferred to the rupee in the degenerate days of native mints, and it might be useful to those who take interest in the subject, to know that all the mints under the British Government, except at the Presidency towns, having now long been suppressed, there was, and, I believe, still is a mint furnished with tools exactly resembling these, and coining rupees no better than the one before you, to be seen at work at Baroda. I saw it when there in 1857, and have not heard of its either having been abolished or improved."—
12th May 1859.

With reference to Mr. E. E. Elliot's note resigning his membership, &c., the *President*, W. E. Frere, Esq., observed:—

"The meeting must, I am sure, have heard with much regret the

note just read by the *Secretary*. Mr. Elliot was elected a Member of the Society in the year 1816, and has been a constant subscriber to it ever since, and, although we have no 'Papers' to show, as contributions received from him, yet the records show that he has been a most assiduous reader. The "Rules" allow that any person who has, by donation or otherwise, materially contributed to promote the objects of this Institution might be elected an *Honorary Member*. Few have contributed so much as Mr. Elliot has, viz. 43 years' subscriptions, to our funds, and I am sure we should do right in conferring on him this honorary distinction. I have therefore much pleasure in proposing that he be elected an *Honorary Member* of the Society. The *Secretary* and Captain Forbes join with me in this proposal, and therefore we may, in accordance with the Rules of the Society, proceed to his immediate ballot."

A ballot then took place, and Mr. Elliot was unanimously elected.

The following note from General LeGrand Jacob to the *Secretary*, together with its enclosure to General Jacob's address from the Rev. R. Friederich, were read :—

"Bombay, May 22nd, 1859.

"Herewith another letter from Mr. Friederich which I have answered, but I hope you will also send him a line when you acknowledge his late books. Perhaps you could remedy the mistake he speaks of, viz. a double No. VI. and no No. V.

"I don't know what he means by 'exemplars of inscriptions,' but Dr. Wilson will know what he received from him. Dr. Wilson sent me some few sheets a few months ago—and unhappily they have, I think, been packed with my books sent by sea. I was ill at the time, and could not pay proper attention, or they should in preference have been given to our Society. If I find them when in London, I will give them to the Parent Society. I forgot to mention this in my letter to Mr. Friederich. Will you kindly do so ?

"I have sent and am sending him (Mr. F.) altogether eleven Purāṇas, viz :—

- | | | |
|-----------------|---------------|-------------|
| 1. The Bhagwat, | 5. Lingi, | 9. Kurma, |
| 2. Brahmanda, | 6. Waman, | 10. Vaya, |
| 3. Brahma, | 7. Markandya, | and |
| 4. Matsya, | 8. Agni. | 11. Wáráha. |

"The greater number are being copied at Kolapore, and some here by Bhawoo Dajee and Vishwanath Narayan's assistance. My agents,

Smith, Taylor, & Co., have arranged with me for their transmission. When I get home, I shall try and move the Parent Society to interest themselves in the affair. I think it should be taken up rather by a Society than by a private individual liable to be suddenly cut off, and driven hither and thither for health.

"I have urged Mr. Friederich, by every consideration, to get us the Bali edition of the Brahmanda, if he has no time to translate it into English, and to interline Nagri letters between the Kawi.

(Signed) L. JACOB."

Following is Mr. Friederich's letter:—

"Gadok, near Buitenfery, 6th April 1859.

"MY DEAR COL. LEGRAND JACOB,

"I received your letter of 2nd November 1858, on the 7th December, and the Bhagávata Purána on the 29th of the same month.

"I should have written to you long before this, and thanked you for your kindness, but I expected till now an answer to a letter of mine sent on the 7th November 1858, wherein I have recapitulated all the letters and prints I have sent to Bombay since October 1857.

"It seems that nothing from me has reached you, and I shall now make a second recapitulation, hoping that this letter at least, will reach you, because I send it to the care of a merchant-house at Singhapura.

"There has been lost also one letter and package from Hongkong, and one from Calcutta, all at Singhapura; but the rest of my correspondence with these two places has not miscarried. I cannot understand how all and every thing sent to Bombay should have been totally lost. I give you an accurate account of all I know of since 1856.

"A letter from Mr. Carter, *Secretary*, Bombay Branch of the Royal Asiatic Society, dated 1st of February 1856, was received in March or April of the same year. It contained my nomination as an Honorary Member of your Society on the proposition of yourself, the Rev. Dr. J. Wilson, and Colonel J. Hale, and annexed to it, a wish of the Society that I would edit the Brahmanda Purana of Bali.

"At the same time I also received a complete set of the Society's Journal up to that date, and a short time afterwards received the last part of Vol. V. of the same Journal; only I have received by mistake two exemplars of No. 5 of Vol. I., and none of No. 5. This has happened because to the one exemplar of No. 6 the outer cover of No. 5, with the enumeration of the contents of that number had been affixed. I should have answered quickly to that letter, and attested the high sense

I have of the honour (quite undeserved) done to me by your Society, and should have thanked you and your friends for proposing me a Member, and the Society for kindly presenting me with their valuable Journal, if it had not been for my desire to give at the same time, a token of my thankfulness, by sending a work edited by me, and some written notes about Javanese inscriptions, with other points of antiquarian research.

"So, with this intention, being besides some time under the scourge of sickness, I delayed answering till October 1857.

"In that month, I gave five exemplars of the *first ten sheets* of an Essay on Inscriptions of Java and Sumatra, to the Rev. Brumund of Batavia, who intended to go to Bombay by the steamer. At the same time (11th October 1857), I sent a letter to you and one to Dr. Wilson, containing my excuses for not having written before that time, and some antiquarian notes.

"On the 11th November 1857, I addressed a letter to Dr. Wilson, including one to you, and at the same time I sent a letter to the Rev. Brumund, whom I supposed to be at Bombay, to the care of Dr. Wilson. To this letter were added 5 exemplars of the rest of my Essay on Inscriptions, and 4 exemplars of the three lithographs belonging to that essay, also two sheets containing the Devanagari of the same inscriptions; together with notes on some other inscriptions, and on the Bhudist confession of faith found in Java.

"Mr. Brumund after all altered his plan when he was at Singhapura, and sent back the exemplars given to him in October.

"These exemplars I sent on the 25th of January 1858 to Dr. Wilson, together with a letter containing some ideas about the oldest Indian figures.

"To all these letters I never got any answer.

"In November (5th) your letter of 11th October 1858 reached me. I answered it on the 7th of November, and asked if nothing had been received.

"To this letter also I got no answer till now.

"The arrival of your letters of 2nd November 1858, and of the Bhagavata Purana lithographed at Bombay, I mentioned in the beginning of this letter. Besides, I received in due time, your letter of the 25th August 1857.

"I am very much obliged to you for the said work, and also for your kind endeavour to get copies of others of the Puranas. I saw them in the correspondence with your friends which you sent to me. You may be sure that I will edit by-and-by the Balinese Purana. I shall have to make first a voyage over Java with a draftsman to collect the inscrip-

tions yet available ; but after this, it is rather certain now that I shall go again to Bali. My endeavours to get a copy of the Purana by means of other people have failed ; but when I go there myself, I shall get all I want from my friend the High Pandit of Bali Badong. Intermediate persons can get nothing, because they have not the confidence of the people.

"In the meantime, I have commenced a correspondence with Rajindralal Mitra, formerly Librarian of the Society of Bengal. He has procured already Prinsep's useful Tables and Prinsep's Journal, and he will certainly do his best to get also copies of some of the Puranas. I have asked him principally for the Brahmanda and Vaya, and besides, perhaps the Agni, Brahmanda, Padma, and Matya.

"By my letters to Dr. Wilson, and the written notes destined for the Bombay Society, I tried to get into a literary correspondence with your learned men who take an interest in antiquarian researches. Now this all seems to be lost ; but if you will favour me with an answer, I shall at least send again two exemplars of my Essay on Inscriptions, and will make up some annotations about other subjects, if anybody would like to receive them.

"Be assured, that I feel very lively the honour done to me by your Society, and I remain very much obliged to your personal kindness.

"Your always truly,

(Signed) "R. FRIEDERICH,

"Secretary to the Batavian Literary and Scientific Society."

Resolved that the number of the Society's Journal (viz. V.), applied for by the Rev. Mr. Friederich be sent to him by the earliest opportunity, and all his presents which have reached the Society, acknowledged with the Society's most grateful thanks.

Geological observations on the Quarry and Intertrappean Lacustrine stratum of Nowrojee Hill. By Dr. G. Buist, LL.D., &c.

Dr. Buist's "Observations" which were illustrated by coloured drawings of Nowrojee Hill, were chiefly intended to bring before the Society the present mode of quarrying there, which he showed to be by excavating the base underneath the freshwater stratum, and then waiting for the "rains" of the Monsoon to soften the mud in the fissures of the impending mass, and thus by land-slip bring down the upper part of the Hill. He also pointed out the portion which had lately fallen, and the manner in which large blocks of it had passed across the railroad into some huts on the other side upwards of two hundred yards

from the base of the Hill, and had thus killed several individuals.—
9th June 1859.

Committee Meeting.—The Committee having met to consider what could be done to arrest the ravages of the White Ants (*Termites*) among the books, and having visited different parts of the Library, and examined the shelves and books which had been attacked by them, resolved :—

“That the *Secretary* be requested to address Government on the subject, informing them of the prevalence of these insects in the Town Hall generally, and also of the destruction they had committed among the Society's books, together with the fact that the contact of the book-cases at their backs with the walls to which they are fixed rendered the access of the White Ants to the books inevitable, and therefore, threatened the whole Library with destruction, if this arrangement of the cases could not be altered.”

It was also resolved—

“That two more Hamalls should be added to the present Establishment, for the purpose of inspecting the books more frequently.”—5th September 1859.

Report by the *President* on 236 silver coins, the property of H. H. the Rao of Kutch, forwarded by General LeGrand Jacob to the Society for examination, with the request that the Society would make a selection for themselves, and return the rest to His Highness :—

“These coins, the property of H. H. Rao of Kutch, which General Jacob left with us to decipher, are, I believe, all of *Skanda Gupta*, and all, excepting one, I think, of that class, with the central symbol in the form of an altar, which, as Prinsep says, is supposed to represent the common altar-shaped receptacle of the sacred Tulsi (sage) plant of the Hindoos.

“Prinsep, in his description of these coins, says that the legends are frequently very incomplete, varying in the number of letters in each.

“On no one coin in this collection are there more than three or four letters legible, and with Vishnu Shastree's assistance, the utmost that I have been able to decipher from these is as depicted in the margin.

“*Sri Skanda Gupta Kramaditya Para.*” Prinsep, vol. II., p. 98, (Thomas's edition) gives the whole legend, viz. “*Parama Bhagavata Sri Skanda Gupta Kramaditya.*”

“But I have not been able to find any in this collection with the ‘*Ma Bhagavata*,’—which would complete the legend.

"General Jacob was so obliging as to say that the Society might take some of these coins, for our collections, and that the rest were to be returned to his Highness the Rao of Kutch. There are fifteen which show the legend as I have read it above, which I would recommend the Society to keep, and the rest should be returned to his Highness, with a copy of this report, and with the Society's best thanks."—*9th September 1859.*

Mr. Newton, in his letter respecting the *Sah* coins in the Society's Cabinet, states as follows :—

"When availing myself of your kind permission to examine the Bombay Branch Asiatic Society's coins, I assigned to their proper compartments 12 out of 13 of the Saurastran coins noted as illegible, and 5 out of 6 others only partially read before ; thus increasing your list of kings by two.

"I notice that you have three coins of *Damajata Shri*, of whose coins I have but a single specimen ; all not illegible. I have, however, three coins of "*Kshatrapa Rudra Sinha*, son of *Swami Jiwa Dama*," which I send herewith. Your Society has no specimen of this king's coins, and I shall be happy to give any one of them in exchange for one of *Damajata Shri*."

The *President*, at the request of the Meeting, was kind enough to undertake the selection of that one from the three coins offered by Mr. Newton which should be taken in exchange for the Society's *Damajata Shri*.—*10th November 1859.*

Committee Meeting.—With reference to what further should be done respecting the incursions of the White Ants it was resolved :—

"That the *Secretary* should draft a letter to Government on the subject, and circulate it to the Committee for approval, also that Major Kendall, the Civil Architect, should be thanked for his having favoured the Committee with his opinion on the matter."—*15th November 1859.*

ANNIVERSARY MEETING.

MONDAY, 28TH NOVEMBER 1859.

The *Secretary*, at the request of the *President*, read the following Report of the *Committee of Management* for the year 1858-59 :—

GENTLEMEN,—During the past year 8 members have been elected, viz. 5 Resident, and 3 Non-resident, that is one less than last year.

Twenty-four members have ceased to subscribe, viz., 17 temporarily from absence from the Presidency, and 7 have withdrawn.

2. To the Library 133 works, or 147 volumes, have been added by purchase, and 62 publications of different kinds have been presented. 123 works, or 150 volumes, have been rebound, and 24 newspaper files stitched.

3. A new catalogue is still a desideratum.

4. There have been 8 donations to the Museum chiefly consisting of coins from Government; and nine Original Communications, of which the Society hardly possesses more than the titles mentioned in the minutes of the proceedings of the meetings at which they were read, the papers themselves remaining with their respective authors for completion preparatory to future publication.

5. Your *Committee* regrets that the want of literary and scientific matter still prevents the issue of another number of the Society's Journal.

6. The total number of periodicals, calendars, army-lists, and almanacks, received during the year has been 89, viz. 57 literary and scientific, of which 24 are presented by the Societies who publish them; 29 newspapers (European and Indian), and 10 calendars, almanacks, and army-lists.

7. The Society's funds, as per balance-sheet laid before the meeting, show a little larger sum in favour of the Society than that of last year; but this, it should be understood, has not arisen from increase in the receipts of the Society, for these have been upwards of 1,000 Rupees less, but from curtailed expenditure in the number of works purchased by the Society independently of the supply from its booksellers; the less expenditure on account of book-binding; and the temporary cessation of the publication of the Society's journal; so that, in fact, if the disbursements on account of these three items had been as great as in previous years, the balance would be much more against, than it is now in favour of the Society.

8. The outstanding subscriptions to the Society, your *Committee* are glad to state, only amount to seventy-five rupees, which merely needs re-application for recovery.

9. On a representation having been made to the *Committee* that the classes of the Library were far from being up with the publications of the day, and that of late years some had been considered almost exclusively to the neglect of others, your *Committee* requested that a tabular list might be prepared, which would show the annual as well as the total number of works that have been added to each of the classes

since the last catalogue was printed, or, during the last 15 years. This list, of which an abstract is given below, is now submitted for inspection, whereby it will be observed that, while the classes containing works for the general reader have received by far the largest additions, the others have not only, not been entirely neglected, but have probably, had as much expended upon them as the Society's funds have been able to allow ; or if not, it is because the deficiencies in them have not been pointed out to the *Committee* by members conversant with the subjects treated of in these classes :—

No. of Class.	No. of Works purchased.	No. of Class.	No. of Works purchased.
1	217	14	57
2	17	15	20
3	19	16	360
4	104	17	9
5	38	18	275
6	15	19	474
7	49	20	554
8	152	21	9
9	38	22	45
10	35	23	298
11	134	24	23
12	13	25	74
13	17	26	239

10. Of the services of Vishnu.Shastree, which, at the solicitation of the Society, have been kindly made available to it by the Government at a salary of Rs. 50 per mensem, since the 10th April 1856, for the purpose of deciphering the Cave-Temple inscriptions of the Bombay Presidency, the Rev. Dr. Wilson, *Honorary President* of the Society, and *President* of the Cave-Temple Commission, under whom Vishnu Shastree has been engaged, states as follows :—

“Vishnu Shastree's progress is, on the whole, as good as could be expected ; my late illness has prevented me from collating all his transcriptions and translations ; but I hope to be able to do this service for the Society as soon as I get my work on ‘Caste,’ through the Press. The results I see are important, and bring to light many errors in the former tentamina connected with the caves.”

11. It is with much regret that the Committee have to inform the Society that the White-Ants, which infest the Town-Hall throughout, have found their way into the Library, and destroyed many of the books.

This was first discovered in September 1858, and since that there have been several incursions in different parts of the Library. In all they have amounted to seven, during which 12 works or 33 volumes have been destroyed, and 12 works or 38 volumes slightly injured; fortunately those which have been destroyed have chiefly consisted of Novels, the others have been works in the classes of Classics and Chemistry;—"Nicholson's Journal" however, has severely suffered. The last incursion discovered, was in the month of August. Means have been taken for suppressing these insects, but without holding out any probability of success, and therefore the subject has become one of much anxious consideration with your *Committee*, who, in despair of being able to find out any radical remedy without a reconstruction of the book-cases generally, which would be attended with great expense, have resolved to refer the matter to Government.

12. Your *Committee* also regret to have to record that, previously, and also since the incursions of the White-Ants commenced, the classes of Foreign Literature and Biography suffered on two occasions severely from leakage in the roof; one from the obstruction of a water-pipe, and the other from obstruction in the gutter leading to it. The former took place in June 1858, when 300 volumes of the classes mentioned were soaked through and more or less destroyed, and the latter in July last, when 400 volumes more of the same classes were similarly injured. On each occasion report was immediately made to the Civil Architect, who promptly had the obstructions removed, and stated that they had occurred accidentally.

13. Another, but more pleasing fact for record, is the addition of the room formerly used for the office of the Director of Public Instruction to the Library. This was occasioned through the erection of the statue of the late Sir Jamsetjee Jejeebhoy, Baronet, in the central doorway of the Library looking into the vestibule, and the consequent alterations that were necessary in the vestibule and Library, which so deprived the Society of room in the latter, that, on application to the Right Honorable the Governor, Lord Elphinstone, for compensation, connected with the fact that, there were already upwards of two thousand volumes in the library concealed behind others for want of room, His Lordship was pleased not only to make over to the Society the apartment used for the office of the Director of Public Instruction, but at the same time to place the private room of the Director at the disposal of the "Geographical Society," thus giving up the whole of the upper rooms of the northern end of the Town-Hall to the two Societies; bringing them together, by which they might mutually assist each other; and

removing from their neighbourhood everything that could tend to disturb that quiet and repose which is so essential to the attainment of their respective objects.

14. Consequent on the addition of the room mentioned to the Library, the Society becomes in possession of a much better apartment for its Museum, both as regards space and light, than the present one, and therefore your *Committee* would suggest that, the contents of the latter should be transferred to the former as soon as possible, particularly as, through the liberality of the *President*, a sum of money has been guaranteed to the *Secretary*, for defraying all expenses connected with this change.

This report was received, and the best thanks of the Society voted to the *President*, Vice-Presidents, and Members of the Committee of Management for their valuable services during the past year.

Dr. Leith, seconded by Dr. Harkness, moved a special vote of thanks to the *President* for his liberality towards the Society in behalf of the removal of the Museum to the newly acquired apartment, which was unanimously carried.

The following gentlemen were elected for the Committee of Management, Auditors, and Museum Committee for the ensuing year,—the *President*, Vice-Presidents, *Secretary*, and *Treasurer* being considered re-elected :—

Committee of Management.

Captain J. G. Forbes.	W. C. Coles, Esq., M.D.
Thomas L. Jenkins, Esq.	B. P. Rooke, Esq., M.D.
H. L. Anderson, Esq., C.S.	R. Willis, Esq.
The Rev. G. Cook.	Bhawoo Dajee, Esq.
E. I. Howard, Esq.	G. C. M. Birdwood, Esq., M.D.

Museum Committee.

A. H. Leith, Esq., M.D.	H. J. Carter, Esq., F.R.S.
Thomas L. Jenkins, Esq.	G. C. M. Birdwood, Esq., M.D.
John Harkness, Esq., LL.D.	Bhawoo Dajee, Esq.

Auditors.

Captain J. G. Forbes.	R. Willis, Esq.
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Dr. Birdwood, seconded by Dr. Dallas, moved—

“That the Cave-Temple Commission be requested to be good enough to furnish a detailed statement of the Caves examined, and Inscriptions deciphered or copied, and how many Caves and Inscript-

tions remain to be examined, together with an estimate of the time it will probably require to complete the work proposed to be gone through."

This was carried, and the Secretary directed to forward the "Resolution" to the President of the Cave-Temple Commission, with the Society's request that the Commission would reply to it at their earliest convenience.

The following list of papers, proposed to be added to the periodicals already taken by the Society, was then laid before the meeting, viz:—

The *Leader*, *Saturday Review*, *Daily News*, *Press*, *Argus*, *New York Herald*, *Friend of China*, a Cape paper, a Singapore paper, *Westminster Review*, *London or Dublin Statistical Journal*, *Law Times*, *Malta Gazette*, *Le Nord*, *L'Univers*, *Le Moniteur*, *Le Pays*, *La Presse*, *Journal des Debats*, *Levant Herald*, and *Le Siècle*.

After a prolonged discussion, it was resolved, upon the following motion proposed by Dr. Dallas, and seconded by Dr. Birdwood, and carried unanimously—

"That the list be referred to the *Committee of Management*, with a request that they will decide on the proposition."

There being no other business before the Society the meeting adjourned.

FROM THE 28TH NOV. 1859 TO THE 25TH NOV. 1860.

With reference to the letter from the Literary and Philosophical Society of Manchester, proposing an exchange of Publications with the Society, and offering "14 or 15 volumes" of their "Memoirs" in return for as complete a set of the Society's Journal as possible, the Secretary was requested to forward a complete copy of the Society's Journal to the Manchester Society through Messrs. Smith, Taylor, and Co., with as little delay as possible; and on announcing the despatch to the Manchester Society, to express the Society's willingness to exchange all future publications with them.—*8th December, 1859.*

Committee Meeting.—It was resolved, with reference to Dr. Dallas' motion regarding the Periodicals proposed at the Anniversary Meeting—"That the 'New York Herald' and the 'Law Times' only should be added from the 1st of January 1860." The *President*, Dr. Birdwood, and Bhawoo Dajee, Esq., having kindly offered to present the "Argus," "Saturday Review," and "Leader" respectively.—*28th December, 1859.*

On the proposition of E. I. Howard, Esq., J. S. White, Esq. and Dr. Harkness, *Vice-President*, Dr. Martin Haug was unanimously elected an *Honorary Member*.—12th January, 1860.

Dr. Martin Haug's letter acknowledges, with thanks, the honour conferred on him by the Society, in having elected him an *Honorary Member*, and hopes to supply contributions from time to time to the Society's Journal on different subjects of Oriental Literature, especially on the writings of the Brahmans (*Veda*), the Parsee (*Zend-Avesta*), the Buddhist (*Tripitaka*), and on the Modern Indian tongues.—9th February, 1860.

With reference to M. Laporte's letter (No. 798, dated Bordeaux, 30th November 1859, to the address of the *President*, which was received on the 5th April), again inviting an exchange of terrestrial and other shells, &c. with the Society, and alluding to his having received no reply to his former communication on the subject, Dr. Birdwood, at the request of the Meeting, consented to address Monsieur Laporte, in behalf of the Society, in this respect.—12th April, 1860.

The Honorable the *President* stated, with reference to the decease of the Honorable Mountstuart Elphinstone—

That it was customary in most learned Societies, when a distinguished member had been taken away from them by death, for the *President* of the Society, at their Anniversary Meeting, to give a sketch of his life and connection with the Society; that we had no such custom in our Society, but since a great and distinguished member of the Society had lately passed away, it would be thought becoming in us that we should place on record some Memoir of his connection with the Society, and his contributions to Literature.

The Honorable the *President* further observed that, his absence from Bombay at the first Meeting of the Society, after the death of Mr. Elphinstone had been heard, had prevented him from then bringing the subject forward, and he was confident that feelings of delicacy alone had prevented others from having taken upon them what they must have known to be his duty.

At the last Meeting of the Society, the first after his return to Bombay, the Honorable the *President* had requested the Rev. Dr. Wilson, our *Honorary President*, to draw up a short Memoir on the subject, which Dr. Wilson would now read to the Society. In deputing this

task to Dr. Wilson, the *President* had no fear of being accused of having shown any disrespect to the memory of one whom no Civil Servant on the Bombay Establishment, nor any other man who has had any opportunity of observing his character, could fail to admire and respect.

Dr. Wilson then read his memorial of the Honorable Mountstuart Elphinstone, for which see p. 97.—10th May, 1860.

It having been noticed that, according to the custom of the Society, His Excellency the Governor, Sir George Russell Clerk, K.C.B., should be invited to become *Patron*, but that his departure for Poona would take place so soon, that it would be necessary to postpone this until His Excellency's return; the Honorable the *President* kindly offered to write to His Excellency on behalf of the Society, and invite him to accept the *Patronship*.

The *Secretary* having stated that he had circulated a "Memorandum" to the *Committee of Management* respecting the vacancies caused in the two *Auditorships* by the departure to Europe of Mr. Willis and the decease of Captain J. G. Forbes, and it having been proposed that a resolution should be brought forward at the next Meeting (viz. to-day,) expressive of the Society's sense of the loss they had sustained in the sudden death of Captain Forbes,—the *Secretary* was requested to read the "Memorandum" and the Minutes of the Honorable the *President* and members of the *Committee of Management*,—after which, the following "Resolution" was unanimously carried:—

"That the Society desire to express the full appreciation of the obligation they owe to the late Captain J. G. Forbes for the valuable services rendered by him as *Auditor of Accounts*, and by assisting in other ways to promote the usefulness of the Society, and to place on record the great loss they have sustained by the lamented death of such an esteemed friend, as well as useful Member of the Society."—14th June 1860.

The *Secretary* stated, with reference to M. Laporte's letter to the address of the Honorable the *President* (No. 797, dated 30th November 1859, read at the Society's Monthly Meeting, 12th April 1860), relative to an interchange of terrestrial and other shells, &c., that Dr. Birdwood had kindly replied to this letter by the last Mail, and that a copy of the letter had been recorded in the letter-book.—12th July 1860.

With reference to the resolution of last Anniversary Meeting requesting that the Cave-Temple Commission should “furnish a detailed statement of the Caves examined and Inscriptions deciphered, &c.,” the Rev. Dr. Wilson, *Honorary President*, and *President* of the Cave-Temple Commission, presented the following Report (See Anniversary Meeting).—13th September, 1860.

ANNIVERSARY MEETING.

MONDAY, 26TH NOVEMBER 1860.

The Hon. W. E. Frere, C.S., *President*, having taken the chair, requested the *Secretary* to read the Annual Report.

GENTLEMEN,—During the past year, 14 Members have been elected, all of whom are Resident. The Society has lost 5 Members by death ; 4 by retirement from the service ; 3 have withdrawn, and 44, viz. 26 Resident and 18 Non-Resident Members are on furlough in Europe. 86 Members now remain on the list, viz. 63 Resident, and 24 Non-Resident Members.

Honorary Members.—Two gentlemen have been elected Honorary Members, viz. E. E. Elliott, Esq., of the Bombay Civil Service, who, after having been a Member of the Society for 43 years, retired to Europe in June last ; and Dr. Martin Haug, Professor of Sanskrit in the College at Poona, distinguished for his contributions to Oriental History and Literature.

Obituary.—Among the deceased Members who have contributed to the advancement of the objects of the Society, your Committee would notice the following, viz:—

1st.—The Honorable Mountstuart Elphinstone, formerly *President* of the Society, of whose well-known liberality towards the Society and exertions in its behalf, together with a list of his contributions to Oriental History and Literature, the Rev. Dr. Wilson, *Honorary President* of the Society, has written a “Memoir,” which was read at the Society’s Monthly Meeting, held on the 10th May 1860, and will be published in the next number of the Society’s Journal.*

2nd.—Lord Elphinstone, late Governor of this Presidency, scarcely less deserving of commemoration by the Society than his Illustrious Uncle just mentioned, for the countenance and aid he afforded it, died a short time afterwards.

* See this No. p. 97.

3rd.—George Buist, Esq., LL.D., F.R.S., and Member of many other Scientific Societies in Great Britain, who left Bombay on the 16th September 1859 to join an appointment under Government at Allahabad, and died at Calcutta on the 1st October 1860, highly meriting honorable mention by the Society for his zealous efforts in the advancement of Science and Literature generally. Dr. Buist contributed many valuable "Papers" to the Society's Journal, among which might be noticed his observations "On the comparison of Barometers," "On a collection of Geological specimens from Aden," "On the Eclipse of the Sun of the 21st Dec. 1843," "On the Meteorology of Bombay," and "On the Runic Monuments of Scotland." He also frequently brought subjects of much scientific interest before the Society at their Monthly Meetings, and made many valuable donations of Geological Specimens to the Museum, on the *Committee* of which he acted as Member from its commencement to the time of his departure from Bombay, not even forgetting to send back contributions to it obtained at Ceylon* on his way to Calcutta.

4th.—John George Forbes, Esq., Captain 23rd N.L.I., Acting Military Auditor General, and for several years one of the *Auditors* of the Society, respecting whom the Society recorded a "Resolution" at their Monthly Meeting held on the 14th June 1860, expressive of their great esteem and obligation for his services. [See p. xxxvi.]

Library.—To the Library 196 works in 261 volumes have been added by purchase, and 108 books and pamphlets received as presents, while 46 works, in 145 volumes, have been rebound.

The total number of Periodicals, Calendars, Army-Lists, and Almanacks taken in by the Society during the past year amounts to 96, viz. 38 Literary and Scientific, of which 20 are presented by the Societies who publish them, 28 Newspapers (European and Indian), and 10 Calendars, Almanacks, and Army-Lists.

Your *Committee* now trust that the long-desired Catalogue of the Books in the Library will be published during the ensuing year, as they have resolved to accept an offer that has been lately made to them to prepare one, such as the Society may require, within 8 months after the date of agreement.

In the Annual Report of 1858-59, your *Committee* expressed their great anxiety respecting the destruction of the books committed by the "White-Ants." They are now glad to be able to state that during the past year there has not been a single incursion of these insects into the Library.

* See p. xvii.

Museum.—There have been 16 donations to the Museum during the past year, chiefly consisting of Coins and Geological specimens. The intended transfer of the Museum to the new rooms has not yet been effected, but it is hoped that this will not be delayed, as the want of light, crowded state, and exposure to dust in the present apartment, renders it absolutely necessary, not only for the better display, but for the preservation of the specimens, that this change should be made.

Original Communications.—It is to be regretted that during the past year there have been only six Original Communications, most of which remaining unprepared for publication in the hands of their respective authors, still keep the commencement of a new number of the Society's Journal in abeyance.

Cave-Temple Commission.—The "Report" of this Commission, which was called for upon a "Resolution" to this effect made at the last Anniversary Meeting, was not received until the month of August, on account of the *President* of the Commission, the Rev. Dr. Wilson, *Honorary-President* of the Society, having been absent from Bombay during the first part of the year. It is as follows:—

Report of the Cave-Temple Commission.

"Work done by the Pandit Vishnu Shastree in connection with the Cave Commission:—

1. Essay in Marathi on the Caves and Cave Character.

2—19. Transcript and decipherment in Pali, and translation into Sanskrit and Marathi, of eighteen Inscriptions at *Karla*. Paid three visits to *Karla*, at his own expense, to certify himself about dubious readings. On two of these occasions he was accompanied by Dr. Wilson.

20—21. Do. do. do. of two Inscriptions at *Bhaja*. Paid two visits, at his own expense, to this place. On one of these occasions he was accompanied by Dr. Wilson. Dr. Wilson thinks that one Inscription at this place (probably not of much consequence) has been overlooked both by Lieutenant Brett and the Pandit.

22—23. Do. do. do. of two Inscriptions at *Bedse*. The Pandit visited this locality once at his own expense.

24. Do. do. do. of one Inscription at *Shelarwadi*, discovered by Dr. Wilson.

25—26. Do. do. do. of two Inscriptions at *Nana Ghat*.

27—50. Do. do. do. of twenty-four Inscriptions at *Junnar*.

51—59. Do. do. do. of nine Inscriptions at *Nasick*, some of which are large.

60—63. Transcript and decipherment in Pali, and translation into Sanskrit and Marathi, of four (large) Inscriptions at *Ajanta*.

64—83. Do. do. do. of twenty Inscriptions at *Kanheri*, in Salsette. Six inscriptions at this place are very imperfect. The Pandit wishes to compare his work at this place with the transcripts of Mr. West, lately presented to the Society. He has twice visited *Kanheri* at his own expense.

84—88. Do. do. do. of five Inscriptions at *Mahad*. The Pandit once visited this locality. Total of Cave-Inscriptions finished, 88.

Besides rendering these Inscriptions, the Pandit has deciphered and translated two Inscriptions in the Hala Kanadi character for Government, which were reported on by Dr. Wilson; deciphered and translated for the Bombay Branch Royal Asiatic Society three "copper-plate grants;" he has also often attended Dr. Wilson for direction and assistance, and has examined coins for Mr. Frere and Col. LeGrand Jacob.

Dr. Wilson thinks that a fair amount of work (considering its great difficulty) has been performed by the Pandit since he was taken into the employment of the Cave Commission in February 1856.

The Pandit thinks that another year will be required to finish the Cave-Inscriptions which have already been procured. His services will be required by Dr. Wilson, when the whole of his work is compared with what has been done by others in the transcription and translation of the Inscriptions.

The learned Professor H. H. Wilson suggests in his paper that the Girnar Tablets, as published by him, should be revised by a party practically acquainted with the Pali. It is very desirable that this should in due time be done by the Pandit."

Finance.—The sum of receipts during the past year amounts to Rupees 6,536-2-8, which, added to the balance of 1858-59, makes a total of Rs. 9,963-6-5. That of the disbursements has been Rs. 6,287-4-11. The present liabilities of the Society amount to Rs. 400, and the outstanding subscriptions to Rs. 160, thus leaving a balance of Rs. 3,726-1-6 in favour of the Society on the 31st October 1860.

The Report having been accepted, the Rev. Dr. Wilson, seconded by Mungaldass Nathoobhoy, Esq., proposed "that the best thanks of the Society be voted to the Honorable the *President* and the *Committee of Management* for their valuable services during the past year,"—which was unanimously carried.

The Hon'ble the *President* then observed, with reference to the "Annual Report," that there were two points in it which he thought required further consideration, viz., first, whether or not, the work performed by

the Shastree who is engaged under the Cave-Temple Commission in deciphering the Cave-Temple Inscriptions, justified a continuation of the Government allowance on this account; and second, whether it was not desirable that all "Original Papers" should be delivered to the *Secretary*, complete, six days at least, before the Meeting at which they are to be read.

After a long discussion on the first point, it was proposed by the Rev. Dr. Wilson, *President* of the Cave-Temple Commission, seconded by James Gibbs, Esq., C.S., and carried —

"That another year be allowed to the Pandit of the Cave-Temple Commission to complete his translations of the Inscriptions already received (viz. about 140), on the understanding that his engagement in this matter be then finished."

The Meeting now proceeded to the election of the Office-Bearers of the ensuing year,—the *President*, *Vice-Presidents*, and *Secretary* being considered re-elected.

Vice-President.

The Honorable H. W. Reeves, C.S., was elected *Vice-President* to supply the vacancy caused by the departure of the Honorable A. Malet, C.S.

Committee of Management.

H. L. Anderson, Esq., C.S.	James Gibbs, Esq., C.S.
W. C. Coles, Esq., M.D.	J. S. White, Esq.
B. P. Rooke, Esq., M.D.	Rev. C. T. Wilson.
Bhawoo Dajee, Esq.,	Sir Alexander Grant, Bart.
G. C. M. Birdwood, Esq., M.D.	W. Steven, Esq.

Museum-Committee.

A. H. Leith, Esq., M.D.	G. C. M. Birdwood, Esq., M.D.
J. Harkness, Esq., LL.D.	Bhawoo Dajee, Esq.
H. J. Carter, Esq., F.R.S.	Captain A. Aytoun.

Auditors.

J. M. Erskine, Esq., C.S.	J. A. Forbes, Esq.
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Cave-Temple Commission.

President.

The Rev. John Wilson, D.D.

Members.

Dr. Harkness, Bhawoo Dajee, Esq., H. Newton, Esq., C.S.

Revision of the Periodicals.—The proposed discontinuations and additions in this list having been submitted *seriatim* to the Meeting, resulted in the "Atlas for India," the "Weekly Press," the "Naval and Military Gazette," the "Medical Times," the "United Service Magazine," and "Tait's Magazine" being discontinued, and the "Army and Navy Gazette" added, to the list of periodicals.

There being no other business before the Society, the Meeting was adjourned.

FROM THE 26TH NOV. 1860 TO THE 25TH NOV. 1861.

It was proposed by Dr. Birdwood and carried unanimously that the following "Resolution" be moved at the next Meeting:— "That the Cave-Temple Commission be requested to re-arrange the programme of their proceedings in accordance with the plan communicated to the Society when the formation of the Commission was suggested by Government."

Read a "circular" from Messrs. Smith, Elder and Co., the Society's Booksellers, announcing their intention to discontinue the "Book-business" hitherto carried on by them at Bombay under the firm of Smith, Taylor and Co., and that in future Mr. R. S. Crossley would act as their Agent at Bombay.—13th December, 1860.

The *President* called upon Dr. Birdwood to bring forward his motion made at last meeting respecting the Cave-Temple Commission.

Dr. Birdwood, in introducing it, directed the Society's attention to two points, viz :—1st, The Society's authority over the Cave-Temple Commission, and 2nd, The nature of the programme prescribed for it when appointed by the Society.

The subjection of the Commission to the Society was proved by references to the following documents (see Unpublished Proceedings).

Dr. Birdwood then detailed the plan suggested by the Government, and having stated that the cost of departing from it had been Rs. 25,000 in round numbers, moved :—"That the Cave-Temple Commission be requested to re-arrange the programme of their proceedings in accordance with the plan communicated to the Society when the formation of the Commission was suggested by Government."—This was seconded by the *Secretary* in order that it might be discussed.

The Rev. Dr. Wilson requested time to reply to it, and on the proposition of J. Gibbs, Esq., seconded by the Rev. Dr. Wilson, it was unanimously carried :—"That the discussion be adjourned until the next Meeting, and that the Cave-Temple Commission be requested in

the mean time to favour the Society with such remarks as they think necessary on Dr. Birdwood's motion."—10th January, 1861.

Proposed by E. I. Howard, Esq., seconded by J. S. White, Esq., for discussion at the next Meeting:—"That it is desirable to sell by auction a large portion of the Novels and other books of Ephemeral interest accumulated in the Library."—12th January, 1861.

Mr. Howard's motion above-mentioned having been discussed was carried, and on the proposition also of Mr. Howard, seconded by H. B. Ellis, Esq., C.S., it was also carried:—"That a Sub-committee, consisting of A. H. Leith, Esq.; E. I. Howard, Esq.; Dr. Birdwood; J. S. White, Esq., and the *Secretary*, be appointed to prepare a list of such works in the Society's Library as it may be desirable to sell by auction, and to submit the same for the consideration of the Society, at a general Meeting to be called for this purpose."—9th February, 1861.

The Rev. Dr. Wilson, *Honorary President*, and *President* of the Cave-Temple Commission, in reply to the "two points" to which Dr. Birdwood requested the Society's attention at the last Meeting respecting the proceedings of the Cave Commission, showed from the Letter-book of the Society that, the propositions of the Cave-Temple Commission had been submitted through the Society to Government; that the employment of the artist, Mr. Fallon, to paint the sculptures in the Caves of the Island of Elephanta, and that of Lieutenant Brett to take impressions of the Cave-Temple Inscriptions in Western India, respectively, had been effected through, and eulogized by the Society; that he (Dr. Wilson) had compiled his 1st Memoir on the Cave-Temples of Western India, and that Government had circulated copies of it throughout the Presidency; that after the receipt of the replies to the queries, he (Dr. Wilson) had compiled his 2nd Memoir; and that, as there were errors in Mr. Brett's impressions as printed in the Society's Journal, and errors also in Dr. Stevenson's translations of them, he (Dr. Wilson) was now engaged with the Shastree (who had been allowed the Society by Government) in collating and correcting these translations, which, by the expiration of the period fixed by the Society for retaining the services of the Shastree, he hoped to complete.—Dr. Wilson added that he thought the cost of Rs. 25,000 not much for what had been done under the Cave-Temple Commission.

The *Secretary* stated that Mr. Fallon's paintings of the sculptures

were very well executed, but very expensive; that Mr. Brett was the only person that could be obtained at the time to take the impressions of the Cave-Temple Inscriptions, and that they were never understood by Dr. Stevenson (who translated them) to be otherwise than a sketch, which was to be corrected and filled in afterwards.

Dr. Birdwood said that he understood Dr. Wilson to say that the Cave-Temple Commission worked independently of the Society,—to which Dr. Wilson replied that, this was a misapprehension of his (Dr. Wilson's) meaning, he (Dr. Wilson) having always considered the Commission to be under the Society.

In that case, and as all seemed agreed upon the point, the Honorable the *President* said that, although much obliged to Dr. Birdwood for having taken so much trouble in bringing forward the subject, he thought that the discussion on it might now cease, as he himself should in future know how to act upon any questions connected with the business of the Cave-Temple Commission. Whereupon Dr. Birdwood stated that he was also satisfied, and begged to withdraw his motion, which ended the discussion.—14th February 1861.

After having briefly stated the contents of his original Communications, Mr. Bhawoo Dajee observed that, the Pundit Vishnool Shastree, who had been employed by the Society under the Cave-Temple Commission to collate and translate the Cave-Temple Inscriptions, was incapable of performing the duty he had undertaken from ignorance of the Cave-Character.

Upon which, the *Secretary* observed that, what Mr. Bhawoo Dajee had said was, in other words, that Vishnool Shastree was a “quack,” and if this was substantiated, and in the end, Vishnool Shastree did nothing, the Society would have to take up the matter seriously, and record a “Resolution” explanatory of the way in which Vishnool Shastree had been retained so long, and indeed employed at all, under such circumstances.—13th June 1861.

Dr. Birdwood intimated that at the next Meeting he would bring forward the following motion for discussion, viz :—

“That the Society has received with regret the ‘Report’ submitted to them on Vishnool Shastree’s labours, and trusts that the Cave-Temple Commission may determine on dispensing with his services; also that the *Secretary* to the Society be directed to embody in the Minutes a statement of the circumstances which have led to this resolution.”—11th July 1861.

The above "motion" having been read to the Meeting, Dr. Birdwood submitted whether it should or should not be discussed before Mr. Bhawoo Dajee's Report on the Shastree's labours had passed through the Cave-Temple Commission.

The Rev. Dr. Wilson, *President* of the Cave-Temple Commission, in vindication of Vishnool Shastree's character, intimated that the Shastree's translations of the Cave-Temple Inscriptions were not completed, and therefore were not yet open to general criticism; hence, whatever observations on them Mr. Bhawoo Dajee had made, should not come before the Society until they had passed through the Cave-Temple Commission.

Mr. Gibbs then read that part of the Cave-Temple Commission's Report which is embodied in the Committee's "Annual Report" for 1859-60, wherein it appears that, the Inscriptions on which Mr. Bhawoo Dajee had written his criticisms, were then laid before the Society as "finished." Upon which, Colonel Pope, seconded by Mr. Newton, moved:—

"That the Book of Vishnool Shastree's Inscriptions shown to the Society at its last Anniversary Meeting, and alluded to in the 'Minutes' of that Meeting, is open to the inspection and comment of any of the Members of the Society."

This was carried—18 having voted for, and 1 against it.

Mr. Newton then stated that it was Mr. Bhawoo Dajee's duty, as a Member of the Cave-Temple Commission, to report on the labours of the Shastree if he thought it necessary; and Mr. Bhawoo Dajee, having shown that he had done that which was right in handing over his folio of criticisms to the Cave-Temple Commission first, the discussion on the original proposition was resumed, when, for the purpose of its being put to the Society as a "Resolution," it was seconded by the *Secretary*.

Colonel Pope then, seconded by Mr. Gibbs, moved the following "amendment," which was unanimously carried, viz:—

"That the discussion of Dr. Birdwood's proposition be postponed until the Cave-Temple Commission's report on Mr. Bhawoo Dajee's criticisms of Vishnool Shastree's Inscriptions be officially laid before the Society, which they trust will take place before the end of the month."
—8th August, 1861.

The Minutes of the last Meeting having been read, the Honorable the *President* asked if it were the pleasure of the Meeting that they should be confirmed, when the Rev. Dr. Wilson, *Honorary President*, and *President* of the *Cave-Temple Commission*, objected to the words

"the inscriptions" standing alone in Mr. Gibb's allusion to the Cave-Temple Commission's Report embodied in the Minutes of the last Anniversary Meeting, and proposed that the words "some of" should be added to them. He (Dr. Wilson) also requested that the following might be added to what he is therein stated to have said in vindication of the Shastree's character.

Dr. Wilson then read the following passages from the Cave-Temple Commission's "Report," which is embodied in the Minutes of the Society's last Anniversary Meeting respecting the progress of the Shastree, and begged that, as they had been stated, so they might be added to the report given of his vindication of the Shastree's character in the "Minutes" of last meeting, viz :—

"The Pundit wishes to compare his work at this place (Kanheri) with the transcripts of Mr. West, lately received by the Society. The Pundit thinks that another year will be required to finish the Cave Inscriptions which had been already procured. His services will be required by Dr. Wilson when the whole of this is compared with what has been done by others in the transcripts and translations of inscriptions."

Mr. Newton observed that if by "some of the inscriptions," it was distinctly understood that 88 inscriptions were meant, he would not object to the addition of the words "some of"; but he doubted if the Shastree's book contained even, up to the present day, 89 inscriptions, or one more than the number represented at the last Anniversary Meeting to be "finished."

The additions proposed by Dr. Wilson having been admitted, the "Minutes" were confirmed.

Extract of a letter from A. Rogers, Esq., C.S., dated Surat, the 31st August 1861, to the address of the *Secretary*, announcing his discovery of "Nummulitic Limestone" in that collectorate, as follows :—

"I sent you, for your inspection and for presentation to the Bombay Branch of the Asiatic Society, some specimens of *Nummulitic* Limestone, which appears to correspond with that of the Rajpeela Hills and the Cutch formation described by Colonel Grant. I found it at Turkesur, about ten or twelve miles to the east of the railway station at Keem River between this and Broach, where the country first begins to be undulating and intersected by ravines as it approaches the hilly districts of Mandwee. I had not time to ascertain the extent of the formation, but found it cropping out from the surface for above a mile from where it lies upon it. The whole appeared to be equally

abundant in fossils; in fact, I suppose the whole rock is little more than one mass of them. Those embedded in the surface are, as you will see, most of them peculiarly perfect. There is no mistaking *Operculina Nummularia* and *Orbitoides*; the latter of every size can be observed, and in every possible variety of section."

The *Secretary* read a note from E. Harrington, Esq., dated 3rd instant, handing in the MS. catalogue which he had prepared for the Society, and begged to know what proceeding should be taken respecting its examination.

Resolved—"That the subject of Mr. Harrington's note," and the MS. catalogue, be referred to the *Committee of Management* for consideration.

The following report of the Cave-Temple Commission on the work done by the late Vishnu Shastrí in the translation of the Cave-Temple Inscriptions was read by the *Secretary* :—

"The Cave-Temple Commission beg to report that, having attentively considered Mr. Bhaú Dají's remarks on the labours of Vishnu Shastrí, together with the "Minutes" recorded thereon by the different Members of the Commission, the majority consider those remarks to be, in all material points, correct; and holding the utter valuelessness of the work performed by the Shastrí during the five years of his employment by the Society to be conclusively established, they would have felt constrained, had he been still alive, to recommend his dismissal. They beg to lay before the Society Mr. Bhaú Dají's criticisms, above alluded to, on the book containing Vishnu Shastrí's copies and renderings, and the "Minutes" thereon of the President and Members of the Commission, with an expression of their opinion that, under the circumstances, Vishnu Shastrí's resignation from the 22nd July last should be accepted, his pay ceasing from the 15th April, the date on which he was permitted to leave Bombay on medical certificate.

"That the *Secretary* to the Commission be requested to obtain from the relatives of the late Vishnu Shastrí all documents and other property connected with the Cave-Temple Inscriptions that may have come into his hands, or have been prepared by him in his capacity of Shastrí to the Commission.

"That, as the elucidation and interpretation of the Cave-Temple Inscriptions form no part of the duty for which the Commission was originally appointed by the Honorable the Court of Directors, though the appointment of Vishnu Shastrí was subsequently sanctioned by

Government, the Commission unanimously recommend that the performance of this work be henceforth left to private enterprise."

This report having been received with the best thanks of the Society, the Members of the Cave-Temple Commission were asked if they would be so kind as to read their "Minutes" respectively, on the works performed by Vishnu Shastri, commencing with that of Mr. Bhaú Dají.

Mr. Bhaú Dají read his "Minute," and on account of the lateness of the hour at its termination, an adjournment was proposed; to which the Rev. Dr. Wilson, *President* of the Commission, objected, and claimed an audience for his "Minute" also, as he stated that, the same Members might not be present at another Meeting. This was admitted; and Dr. Wilson, having finished, a hearing was about to be claimed for Mr. Newton's "Minute," when again an adjournment was agitated, which ended in the following "Resolution," proposed by A. F. Bellasis, Esq., seconded by Colonel G. Pope, viz:—

"That the Report of the Cave-Temple Committee, which has been read and received, be adopted and approved by the Society."

The "Resolution" was carried, 8 having voted for, and 3 against it.—
12th September 1861.

Committee Meeting.—The *Secretary* stated that Mr. Harrington had sent in his MS. catalogue on the 30th ultimo; that it had been laid before the Society at its Meeting held on the 12th instant; that it had been resolved at the Meeting that the subject should be referred to the *Committee of Management*, and that, upon its being circulated to the *Committee of Management*, the latter had appointed the present day for meeting to consider it.

It was then resolved—"That the following Gentlemen be appointed a *Sub-Committee* to examine and report upon the MS. catalogue made by Mr. Harrington, and requested to state—1st, whether it be prepared according to Mr. Harrington's agreement with the Society; and 2nd, whether, in the *Sub-Committee's* opinion, it be such a catalogue as the Society ought to print, viz:—The Rev. Dr. Wilson; Colonel Pope; J. Gibbs, Esq.; Dr. Birdwood, and Bhaú Dají, Esq.—24th September 1861.

Museum-Committee Meeting.—It having been stated by Dr. Leith that, as the Museum of the Society was very scantily catalogued, and the *Secretary*, under whose charge it had been for many years past, had, of course, more knowledge of its contents than any other person, it was desirable to secure this knowledge as soon as possible.

The *Secretary* replied that he had had "numbers" painted on all the drawers, and that it was his intention, during the course of next month (December), to enter the contents of the "drawers," generally, in the Museum Catalogue, but he could not consent to write a detailed account of each specimen. Further, he observed that most of the Indian Geological Specimens had already been mentioned generally in his Geological Papers, which had been published at different times in the Society's Journal, to insure at once, a record of the facts which they demonstrated, and that any Geologist, on reference to the "drawer" containing the specimens alluded to in these "Papers," would easily be able to recognize them individually. But if the Society wished for more, that was a detailed account of each specimen, he was willing to dictate this, so far as his knowledge extended, if any one would number the specimens first, and write down what he (the *Secretary*) might have to say of them afterwards.

Dr. Birdwood stated that he would be happy to undertake this part, and the Meeting, having decided on the amount of disbursement which they thought might be allowed for this purpose, was adjourned.—
14th November 1861.

ANNIVERSARY MEETING.

MONDAY, 25TH NOV. 1861.

The *Secretary*, at the request of the Honorable the *President*, read the following Report of the *Committee of Management* for the year 1860-61 :—

GENTLEMEN,—During the past year 18 resident Members have been elected, that is, four more than last year; three have re-joined, one has withdrawn, and four are temporarily absent in Europe. There are at present on the list 98 Members, viz. 78 Resident, and 20 Non-Resident Members.

Library.—To the Library 264 works, comprised in 330 volumes, have been added by purchase; 80 works, comprised in 305 volumes, have been rebound, and 74 Newspaper-files stitched; while 97 works, comprised in 259 volumes, have been presented to the Society.

Your *Committee* have lately had before them some suggestions for improving the means through which the Society is supplied with books, in order that a better selection may be insured; also suggestions for improving the circulating establishment, and for inspecting the Library generally, for the purpose of disencumbering it (in accordance with a

previous Resolution) of the useless ephemeral literature and duplicates which now occupy disadvantageously a large portion of the shelves.

Catalogue.—In the last Annual Report, your *Committee* expressed hope that the new Catalogue would be made during the year 1861, as they had entered into arrangements for this purpose. The MS. of this Catalogue was sent in to the Society on the 30th of August last, and subsequently laid before a *Sub-Committee* for examination.* By the *Sub-Committee* it was pronounced to be still very imperfect, and to require many corrections and additions; but on its having been returned to the gentleman who made it, he replied that "he was compelled, by causes wholly unconnected with the Society and its proceedings, to abandon, at great loss, the work of months, and withdraw from the preparation of the Catalogue." The MS. had been returned to the Compiler with a moiety of the sum agreed upon for reimbursement, but the latter was remitted, and the MS. retained. Under these circumstances, your *Committee* have again to seek for means of obtaining the new Catalogue.

Periodicals.—The total number of Literary and Scientific Periodicals, Calendars, Army-Lists, and Almanacks received during the past year does not differ from that of 1859-60.

The *Committee* are glad to be able to state that the Library has sustained no damage from white-ants during the past year, and none from leakages through the roof during the last monsoon.

Museum.—There have been 17 donations to the Museum during the past year, chiefly consisting of Geological Specimens, and the *Museum Committee* report that they have made arrangements for obtaining a catalogue of the contents of the Museum generally, as far as may be practicable†; after which, the whole may be systematized previously to its removal into the opposite apartment, as contemplated in the Annual Report of 1859-60.

Original Communications.—There have been 15 Original Communications read before the Society, of which eleven MSS. only have come into its possession, and of the four others the Society have nothing but the titles in the Minute-Book. The Honorable the *President* at the last Anniversary Meeting adverted to the practice of bringing incomplete "Papers" before the Society; and your *Committee* not only regret that this has been repeated, but recommend strongly that in future the Honorable the *President's* recorded observation be enforced, viz. "that all Original Papers should be delivered to the *Secretary* com-

* The MS. has since been generously presented to the Society by the gentleman who compiled it.

† See "*Committee-Meeting*," p. xcvi. *ante*.

plete, six days at least before the Meeting at which they are to be read ;" the contrary practice leading the public to expect in the Society's Journal "Papers" which have never been received.

Journal.—The printing of the 21st Number of the Society's Journal, which will contain the first part of Volume V., is nearly completed, and will be issued during next month. It will include, with the exception of the "four Papers" above mentioned, all that have been read before the Society from the date of last publication up to the present day, together with abstracts of the "Proceedings."

The Shastri.—At each of the last four Anniversary Meetings your Committee have expressed more or less anxiety respecting the progress of the Shastri. They now have to report that during the past six months (as will be seen by the "Proceedings")* the subject has seriously occupied their attention, and they have the unpleasant duty to state that the labours of the Shastri (who died in June last) have been pronounced by the majority of the Members of the Cave-Temple Commission to be "utterly valueless." †

Finance.—The sum of receipts during the past year (that is, up to the 31st October last) amounts to Rs. 6,842-8-0, which, added to the balance of 1859-60, makes a total of Rs. 10,568-9-6. That of the disbursements has been Rs. 5,328-15-0. The present "liabilities" of the Society amount to Rs. 2,218-13-4, thus leaving a balance of Rs. 3,025-13-2 in favour of the Society; with outstanding subscriptions of Rs. 275. Adding, then, the remaining portion of the "Malcolmson-Testimonial Fund," viz. Rs. 2,873-8-5 (now the property of the Society, with Messrs. Forbes & Co.), to this balance, we have a total of Rs. 5,899-5-7 in favour of the Society, plus the outstanding subscriptions, most of which have since been paid.

This balance may appear large, but when it is considered that it consists of Rs. 1,942 retained (to pay for the new catalogue) from the allowance of Rs. 200 per mensem for book-binding—a sum, although the utmost that the Society can afford, yet totally inadequate to meet the "wear and tear" of the Library; that the Catalogue, if it had been prepared and printed would have cost the Society Rs. 5,000, and that the printing of the number of the Society's Journal, now in the press, is not included in the "liabilities,"—the apparent balance in favour of the Society will be re-placed by a deficiency.

After a short discussion, it was proposed by the Rev. Dr. Wilson, Honorary President, seconded by D. J. Kennelly, Esq., and carried unanimously, "that the Report be received with the best thanks of the

* See p. xciv. *et seq. ante.*

† See p. xcvi. *id.*

Society to the Office-bearers for their valuable services during the past year."

The Meeting then proceeded to the election of Office-bearers for the year 1861-62, when the following gentlemen were chosen for the different Committees and Auditors respectively :—

Committee of Management.

Colonel H. B. Turner.	G. C. M. Birdwood, Esq., M.D.
W. C. Coles, Esq., M.D.	J. A. Forbes, Esq.
Bhaú Dají, Esq.	James Gibbs, Esq., C.S.
Rev. C. T. Wilson.	A. K. Forbes, Esq., C.S.
B. P. Rooke, Esq., M.D.	Sir A. Grant, Bart.

Auditors.

J. A. Forbes, Esq.	Captain J. T. Annesley.
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Museum Committee.

J. Harkness, Esq., LL.D.	Bhaú Dají, Esq.
H. J. Carter, Esq., F.R.S.	G. C. M. Birdwood, Esq., M.D.
A. H. Leith, Esq., M.D.	H. Newton, Esq.

Cave-Temple Commission.

The Rev. John Wilson, D.D.

Members.

John Harkness, Esq., LL.D.	H. Newton, Esq., C. S.
Bhaú Dají, Esq.	

Revision of the Periodicals.—The proposed discontinuations and additions in this list having been submitted *seriatim* to the meeting, resulted in the "Fortnightly Overland Times of India" being discontinued, and the "Art Journal" added to the list of periodicals.

LIST OF MEMBERS.

Patron.

His Excellency the Honorable Sir G. R. CLERK, K.C.B.

Honorary President.

The Rev. JOHN WILSON, D.D.

President.

Honorable W. E. FRERE, C.S.

Vice-Presidents.

A. H. Leith, Esq., M.D.	Honorable H.W. Reeves, C.S.
Col. G. Pope, C.B.	John Harkness, LL.D.

Committees, Auditors, and the Cave-Temple Commission as in the foregoing page.

Secretary.

H. J. Carter, Esq., F.R.S.

Honorary Members.

1829* Chevalier Cæsar Moreau, Paris.	1848 Le Vicomte de Kerckhove, Antwerp.
1830 Sir J. Gardiner Wilkinson, London.	„ M. Eugene de Kerckhove, ditto.
1832 Mons. Garcin de Tassy, Paris	„ M. Felix Bogaerts, ditto.
1835 Baron C. Hügel, Vienna.	1849 Captain Inglefield, R. N., London.
„ A. S. Walne, Esq., Cairo.	„ B. Hodgson, Esq., Beng. C.S., ditto.
1839 Prof. T. Pavie, Paris.	1855 Rev. R. H. Th. Friederich, Batavia, Java.
1842 N. L. Westergaard, K.D., Copenhagen.	1859 E. E. Elliot, Esq., Bombay C.S., London.
„ Prof. C. Lassen, Bonn.	1860 Dr. Martin Häug, Poona.
„ M. M. Etienne de Quartre- mere, Paris.	
1845 Le Marquis de Ferriere de Vayer.	

* The figures mark the year of election.

Ordinary Members.

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| 1828 Colonel Sir P. M. Melvill,
K.C.B. (Europe). | 1847 A. H. Leith, M.D. |
| 1830 The Rev. John Wilson, D.D. | „ Comdr. J. G. Constable, I.N.
(Europe.) |
| „ †Major-General J. Hale. | „ Major H. B. Dunsterville. |
| 1831 Hon'ble W. E. Frere, C.S. | „ M. Davidass, Esq. |
| 1832 H. Young, Esq., C.S. (Eu-
rope). | 1848 †Venayek G. Shastree, Esq. |
| „ Colonel H. B. Turner. | „ †Lieut. Col. W. Whitelock. |
| „ Colonel LeGrand Jacob, C.B. | „ †Rev. J. Glasgow, D.D. |
| 1835 John Harkness, LL.D. | 1849 †The Rev. J. D. Gibson,
(Europe.) |
| 1840 H. L. Anderson, Esq., C.S.
(Europe). | 1850 Dhunjeebhoy Framjee, Esq. |
| „ Manockjee Cursetjee, Esq. | „ †Col. C. W. Tremenheere,
C.B. |
| 1841 †C. J. Erskine, Esq., C.S. | „ †B. White, Esq. |
| „ W. H. Harrison, Esq., C.S.
(Europe). | 1851 Rustomjee Jamsetjee, Esq. |
| 1842 H. J. Carter, Esq., F.R.S. | „ Sorabjee Jamsetjee, Esq. |
| „ Lieut. Col. W. E. Evans,
(Europe). | 1852 Bhaú Daji, Esq. |
| „ †Sir H. B. E. Frere, K.C.B. | „ G. R. Ballingall, M.D. |
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